1st Boehringer Ingelheim Expert Forum on

Farm Animal Well-being

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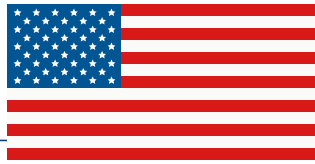
Content


Expressing the need for more relevant education and awareness

Improved animal well-being is rewarding

Prof. Suzanne T. Millman

Dr. Suzanne Millman joined the faculty of the Iowa State University College of Veterinary Medicine in February 2008, as Associate Professor of Animal Welfare in the Veterinary Diagnostic and Production Animal Medicine and the Biomedical Sciences departments. Dr. Millman leads an active research program in food animal welfare, coordinates animal welfare instruction within the DVM curriculum and provides expertise in animal behaviour and welfare for producers, veterinarians and the public. Prior to coming to ISU, Millman was faculty at the Ontario Veterinary College in Guelph Canada for five years, where she now holds an adjunct appointment. Millman's research interests include animal welfare assessment, pain and sickness behaviour, with particular interests in addressing the needs of compromised cattle and swine.



Animal welfare and the scientific method

Prof. Suzanne T. Millman
Iowa State University College of Veterinary Medicine, USA

Introduction

Attitudes about the role of animals in society are changing, as a greater proportion of the population lives in urban areas and have less direct experience with agriculture. Approximately 58% of households own pets, and are considered to be family members (Brown & Silverman 1999). Consequently, human-animal bond has become an increasing component of companion animal veterinary practice. The significance of the role of pets in society was particularly evident during the emergency response efforts following Hurricane Katrina, where evacuation efforts were hampered by the reluctance of residents to leave their animals behind. This prompted the Pet Evacuation and Transportation Standards (PETS) Act (H.R. 3858), which was enacted in 2006 and requires state and local emergency planning agencies to develop infrastructure to ensure that pets are evacuated with their owners within emergency response plans.

Opinion surveys consistently indicate that the vast majority of people consider animal products to be an important component of their diets, but at the same time, concerns are expressed that livestock should have good standards of care. For example, in an U.S. survey commissioned by Animal Rights International, 93% of respondents agreed that "animal suffering should be reduced as much as possible, even though the animals are going to be slaughtered" (Caravan Opinion Research Center 1995). Similarly, European surveys indicate concern about animal welfare is high, with regional differences in degree and in concern about particular practices (European Commission 2007; Mayfield et al. 2007). More recently, a survey funded by the American Farm Bureau revealed that 95% of responded agreed with the statement: "It is important to me that animals on farms are well cared for" (Norwood et al. 2007), suggesting that compassion is a basic human value and consistent over time. Furthermore, 81% of responded agreed that "farm animals have roughly the same ability to feel pain and discomfort as humans". It is interesting that despite these statements, well-being of animals ranked poorly relative to other public concerns, scoring 4.15 in importance versus 23.95 - human poverty, 23.03 – the U.S. health care system, and 21.75 – food safety. This discrepancy may reflect the integrated manner in which consumers consider food animal production, such that animal welfare concerns are linked with public health, food safety and environmental impacts rather than as an isolated issue (Pew Commission on Industrial Farm Animal Production, 2008).

Willingness of respondents to act on animal welfare issues appears to be high. In the American Farm Bureau survey (Norwood et al., 2007), respondents reported that the government should take an active role in promoting animal welfare (68%) and were willing to vote for a law requiring farmers to treat their animals better (75%). These results are consistent with recent voter referendum initiatives (Mench 2008), where particular husbandry practices have been banned in some states, such as sow gestation stalls (Florida 2002, Arizona 2006, Oregon 2007, Colorado 2008), veal crates (Arizona 2006, Colorado 2008) and *foie gras* (California 2004). In the 2008 election, California citizens will vote on the proposed "Prevention of Farm Animal Cruelty Act", which would require all animals to be housed with sufficient space to lie down, turn around and stretch their limbs freely. Globally, there is also increasing regulation of production practices by retailers and by producers themselves, with quality assurance labels and branding of products that have specific animal husbandry criteria (Fraser 2006; Mench 2008). At present, farmers face a mixture of requirements, mandatory and voluntary, which can vary enormously according to the program and supply chain they are servicing (Fraser 2006).

Animal welfare science - understanding the animal's perspective

The World Animal Health Organization defines animal welfare as the state of being of an individual, involving health and conditions of life, and uses terms such as "animal protection", "animal care" and "humane treatment" for human actions to provide for animals. Defendable animal welfare standards require scientific knowledge about the animal biology to determine their physical and behavioural requirements. However, it is important to note that ethical or value based judgments provide the underpinning for the scientific questions posed (Croney & Millman 2007). Historically, scientists have disagreed about how animal welfare should be assessed and the relative weight placed on different categories of measurement, in terms of biological function (e.g. Broom 1996), psychological well-being (e.g. Duncan 1996) and natural history (e.g. Barnard & Hurst 1996). Conceptual frameworks have been proposed to reconcile these polarized differences (Fraser et al. 1997; Dawkins 2004), responding to questions about how hard we are pushing animals in our production systems in terms of their biological capacities and evolved behavioural strategies.

The scientific method can provide information to society upon which ethical decisions can be made. The scientific method follows logic, deductive reasoning and transparency so that experiments can be replicated and results compared. Hence, we can attempt to understand an animal's experience by examining its physiologic response and behaviour for short term responses, and performance effects and cognitive effects for longer term responses in chronic situations. A key component is development of a hypothesis with a priori predictions to be tested versus collecting a laundry list of measurements


that to be interpreted afterwards. A criticism of animal welfare research is based on differences in outcomes by researchers from differing disciplines. For example, conclusions about the degree of suffering associated with sow gestation stalls varies according to the parameters measured, with animal scientists reporting benefits to the sow in terms of feed efficiency, body condition score and reproductive performance whereas applied ethologists report costs in terms of behavioural restriction and performance of stereotypies.

A collaborative project at the Ontario Veterinary College was developed to explore post-surgical pain associated with dehorning, drawing from researchers with expertise in dairy health management and applied ethology (Heinrich 2007). Sixty 6-12 week old Holstein heifer calves were blocked by age and randomly assigned to two treatment groups: meloxicam (M) and control (C). All calves were dehorned using heat cautery, receiving a lidocaine corneal nerve block and an I.M. injection of either meloxicam (M) or a placebo solution (C). Three categories of pain assessment were used: physiological (serum cortisol, heart rate, respiratory rate), mechanical (pain sensitivity based on withdrawl response from pressure algometry) and behavioural (general activity, feed intake, video analysis of pain-related behaviour). All measurements were collected after a sham dehorning procedure to determine baseline values, so that each calf acted as its own control. For all calves, dehorning resulted in increased pain responses in all three categories of measurement and the pain response appeared to last for at least 44 hours, when observations concluded. Calves that received meloxicam displayed significantly reduced pain responses relative to control calves, and this effect was consistent in each of the three categories of measurement. Cortisol levels were significantly lower in meloxicam treated calves until 6 hours after dehorning ($p=0.006$). Heart rates ($p=0.04$) and respiratory rates ($p=0.048$) were also lower in the M group and this effect was observed until 24 hours after dehorning. Meloxicam treated calves displayed significantly less ear flicking, a behaviour associated with dehorning pain, through 44 hours post-dehorning ($p=0.003$). Similarly, significant differences were observed for head shaking ($p=0.03$, +6h), head rubbing ($p=0.045$, +30h), and tail flicking ($p=0.02$, +20h). Meloxicam treated calves were less active for the first five hours after dehorning ($p=0.02$), and displayed less pain sensitivity by tolerating more pressure around the horn bud region after dehorning ($p=0.004$). This integrated approach, simultaneously assessing pain using multiple modalities and within calf comparisons, we are able to conclude that meloxicam is an effective intervention for mitigating dehorning pain.

Future directions

Scientists are continuing to develop and refine techniques to assess animal welfare. Despite these advances, frustration has been expressed about the slow rate of progress of implementation (Dawkins 1997; Millman et al 2004). An exciting development is the emerging interest in epidemiology-based experiments using on-farm data, for benchmarking, identification of risk factors and assessment of interventions to address animal welfare in “real world” situations (e.g. Main et al. 2003; Dawkins et al. 2004; Cleveland-Nielsen et al. 2004; Zurbrigg et al. 2005). International collaborations by applied ethology, animal science and veterinary researchers are promising progressions for addressing farm animal welfare in a global market.

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Notes

Dr. James Yeates

James Yeates is currently the resident in welfare science, ethics and law at the University of Bristol, U.K. His areas of interest include euthanasia, concepts of welfare, legal duties of veterinary surgeons and of course positive welfare. He also works as a first opinion veterinary surgeon.

The positive welfare review was undertaken primarily as a relatively minor component of his PhD but has since grown in unexpected areas. It is an area that is deserving – and gaining – increasing recognition, both from scientists and policy-makers.

Assessment of Positive Welfare: A review

Dr. James Yeates
MRCVs, Gloucester, UK

This presentation describes the formulation of a general framework to assess positive welfare provisions, such as relating to pleasure and enjoyment, to practical farm applications.

It hopes to introduce some of the issues associated with positive welfare, including those of appropriate terminology, balance with negative welfare considerations, methods of assessment and of how positive welfare assessment maps onto duties for farmers and veterinarians.

The vast majority of concern for animal welfare has centred upon negative concepts. For example, four of the Five Freedoms are freedoms from negative outcomes and the fifth freedom to express normal behaviour does not explicitly value positive experiences. Ignoring positive aspects of welfare disregards significant aspects both of ethology and physiology. There is nonetheless increasing awareness that this negative approach is incomplete. More recently, there has been an increased focus in a welfare science paradigm that attempts to include positive outcomes. Webster himself asks whether an animal is happy (2005, p6). At the same time, demand-side drives have been predominantly for assurances that animals did not suffer and veterinarian approaches and policies have mirrored this. But more recently, consumers appear to increasingly value higher welfare[1] and the U.K.'s Farm Animal Welfare Council have consequently asserted that 'the encouragement of incremental improvement [and]...attainment of 'higher welfare'...are important aspirations over time in our society.'[2]

There are multiple reasons for the promotion of positive welfare in farm animals, whether as individual farm veterinarians or in policy initiatives such as education programmes, incentive systems, certification schemes or legislation. Firstly, it may add value to produce, since consumers have been shown to value positive welfare. Secondly, enhancing positive welfare may reduce negative outcomes and increase basic productivity, since positive welfare outcomes may require or presuppose the satisfaction of needs. Furthermore, rewarding good outcomes may motivate farmers more than penalising poor performance, yet achieve the same goal of avoiding negative outcomes. Where farmers have a sympathetic relationship with their stock, enriching the animal's welfare can also enrich the carer's welfare. This is in stark comparison with the restrictive deontology of conventional welfare policies. It also allows more flexibility in policy-making. Consequent to these, one might expect some call for the inclusion of positive welfare in farm assurance schemes.

From a theoretical perspective, one problem faced by researchers in farm animal wellbeing has been the focus on satisfying needs. Welfare scientists have vainly endeavoured to categorise which welfare outcomes or inputs are needed, and which are not. If one includes positive aspects, welfare can be considered as a continuum. On such a model, positive welfare concerns can afford a value to providing a resource for which an animal has only a weak or occasional preference or that has no immediate biological effects without entailing that there is an absolute moral duty for animal carers to provide for positive welfare; nor that these should take priority over traditional avoidance of harms. Such considerations are not expected to replace more traditional concerns of welfare, which have achieved significant improvements in animals' lives.

More practically, this talk will discuss early stages in the development of on-farm assessment methods. This involves consideration of everyday pleasures, engagement with other animals and the environment and achievements, all of which can provide positive welfare for farm animals. Establishing the main aims in assessment of positive welfare involved a review of the scientific literature within animal welfare and positive psychology in humans. Developing a practical and sound methodology therefore required some compromise. To this end, a well-known medical ethics (Four Principles) and welfare framework (Five Freedoms) were reviewed and adapted. Work with FAWC has suggested proposals for codifying opportunities in farm animal welfare frameworks. Further to this, some candidate considerations were drawn up as a sample for on-farm assessment parameters, on the model of the Bristol Welfare Assessment Protocol (BWAP) for Cattle. These were pilot-tested on a dairy farm and the results were surprising in their scope and possible usefulness.

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2 FAWC (2005) *Report on the Welfare Implications of Farm Assurance Schemes*, 43


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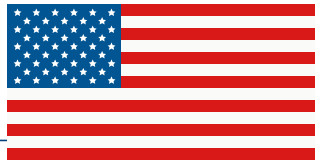

Aiding convalescence: using behaviour of the compromised animal to improve animal welfare

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Introduction

Concerns about ill and injured animals resonate with producers, processors, retailers and the general public alike. Preventive animal health is a key component of all livestock management systems, in terms of facility design, nutrition, breeding and herd health programs. Quality stockpeople possess skills in both the science and art of animal care, such that they develop "an eye" to pick out individual animals that fail to thrive and require specialized care. In addition to concerns about animal welfare, cattle that are compromised due to disease, lameness or poor condition can be targets for bad publicity of the livestock sectors, and often represent economic losses in terms of carcass quality, feed efficiency and costs associated with veterinary care. Through understanding about the behaviour of compromised animals, opportunities to aid recovery and address their welfare.

Understanding the behaviour of the compromised animal

Across different species and in response to an array of pathogen infections, animals display characteristic changes in behaviour that include reduced feeding, increased huddling, shivering, lethargy, sleep and social isolation. Since evolution favors diversity, Hart (1987) postulated that these behavioural responses confer an advantage in terms of biological fitness, and that rather being an unfortunate consequence of infection, these behavioural changes represent an evolutionary strategy to combat disease. Fever is an important component of the immune response to reduce pathogen proliferation (Kluger *et al.* 1975; Vaughn *et al.* 1980). Hart pointed out that to increase core body temperature by 1C, a mammal must increase its metabolic rate by 13%. Hence, sparing energy through reduced activity, huddling and increased sleep facilitates the febrile response, resulting in an internal environmental that is less favorable to pathogen proliferation. Further, anorexia results in animals that expend less effort foraging, are less conspicuous to predators and can devote more resources to mounting an immune response. Hart (1988) postulated that this "sickness behaviour" is a component of a highly organized evolved strategy to combat infection, involving behavioural, immune and endocrine systems. Subsequent research in the interdisciplinary field of psychoneuroimmunology supports Hart's hypothesis, revealing that sickness behaviour is mediated by pro-inflammatory cytokines, IL-1, IL-6 and TNFα within specific sites of the brain. As part of the innate immune response, these

cytokines are released by macrophages and can cross the blood-brain barrier, but they are also produced directly in the brain by glial cells in response to vagal nerve stimulation (Dantzer 2003).

The way in which sickness behaviour is expressed is context-dependent. In behaviour terms, this means that sickness can be viewed as a specific motivational state that competes for expression with other motivational states, such as hunger or sex. When lipopolysaccharide (LPS) is administered to lactating female mice, sickness behaviour is induced and competes with maternal behaviour. When experimenters disrupted the maternal nests and dispersed pups within the cage, dams interrupted their resting behaviour to retrieve their pups. However, nest building behaviour was only performed when dams were housed in rooms at 6C, and not in rooms at 22C (Aubert *et al.* 1997). Importantly, although sickness normally suppresses activity and exploration, these behaviours are expressed when animals are placed in novel environments (Engeland et al. 2001). Conversely, sickness impairs learning of new tasks, but performance of tasks previously learned (Aubert et al 1995b). Interestingly, gender differences exist since LPS reduces sexual behaviour in female rats, but not in males (Yirmiya *et al.* 1995).

Behaviour of compromised cattle

Our research group, and others, are exploring the sickness and pain-related behaviour of cattle, using biotelemetry and video techniques, together with physiologic and performance parameters. Detailed behaviour and physiologic analyses are time consuming and labor intensive. However, technologic advances provide exciting increasing opportunities to collect some parameters automatically, in the field and in the laboratory. Activity monitors can be attached to a hindleg to measure restlessness or restfulness of cattle. This method has been used for detecting increased activity associated with estrus, and is also an effective technique for assessing pain, illness and convalescence. Using pedometers, Todd (2007) found that veal calves experiencing diarrhea due to viral agents display increased activity relative to calves affected by diarrhea due to other (bacterial, parasitic) causal agents (*p=004*). Increased activity in the immediate post-weaning period is displayed by calves that fail to thrive when they are weaned from a milk diet and moved into group housing (Stanton et al. 2008); further study is required to determine if this increased activity results from hunger, gastrointestinal distress or anxiety. However, increased activity has been observed in cows during 8-9 days prior to clinical signs of ketosis, displaced abomasums and digestive disorders (Edwards & Tozer 2004), suggesting that gastrointestinal discomfort may be a factor.

Stockpeople recognize that changes in feeding behaviour are also useful indicators of compromised cattle, often appearing as a first clinical sign of disease (Thomson 2006). Reduced frequency and duration of feeding and drinking behaviour during 11-27 days after arrival has been associated with bovine respiratory disease complex in feedlot calves and severe pulmonary lesions at slaughter (Buhman et al 2000). Direct observations are best made immediately after fresh feed is provided, when motivation to feed should be highest (Blezinger S.B., 2002; Thomson 2006). In some operations, including dairy units, electronic identification allows monitoring of individual animal feed intakes. Two weeks prior to onset of clinical signs, reduced feeding behaviour has been observed in dairy cows that develop metritis and these cows are also less

likely to compete at the feed bunk (Urton et al. 2005; Huzzey et al 2007). Although feeding motivation is depressed during illness, there are also differences in food preferences such that rodents prefer to shift from high protein to high carbohydrate diets during states of illness (Aubert et al 1995a). When offered a variety of foods, beef cattle differ markedly in preferences for food high in protein or energy (Atwood et al 2001), with transient taste aversions among the reasons. Hence, appetite in compromised animals may be stimulated by frequent provision of a variety of fresh feedstuffs that are easy for the animal to access, in terms of competition from other cattle and bunk access.

Caring for the compromised animal

The compromised animal has a different set of behavioural priorities than its healthy herdmates, and hence hospital pens can provide specialized care for recuperation. Unfortunately there has been scant scientific scrutiny about hospital pen design and management. It is recommended that hospital pens should provide 150-200 square feet per animal in beef operations, provided with shelter and easy access to fresh hay, feed and water (Thomson 2006). Resting behaviour increases when cattle have access to comfortable lying surfaces (Rushen et al 2007). Identifying and tracking individual animals is a challenge within feedlot operations, and hence placing an animal in the hospital pen ensures treatment protocols are followed. However, due to the effects of novelty and stress associated with changes to social groups, some compromised animals may fare better in their home pen if they can maintain access to resting, feeding and drinking site while avoiding bulling. The association between sickness and buller-rider syndrome (Taylor et al. 1997) suggests that at in feedlots, pulling infirm individuals to the hospital pen is warranted, whereas cow-calf operations may choose to attend to compromised cows and calves within the home pen or pasture.

Non-steroidal anti-inflammatory drugs (NSAIDs) have been approved for treating inflammation in cattle, but do not appear to confer short-term production benefits when provided to lactating cows affected by mastitis (Wagner & Apley 2004). However, given the role that pro-inflammatory cytokines play in sickness behaviour, NSAID therapy may provide opportunities to improve the welfare and performance of compromised cattle by facilitating convalescence. For her Masters project, Cynthia Todd explored meloxicam as an adjunct therapy for calf diarrhea complex in a double-blind study (Todd 2007; Todd et al, 2007). Sixty-two Holstein bull calves were purchased at birth and transported to a calf research facility where they were individually housed in hutches. Fifty-six calves developed diarrhea and were randomly assigned to receive a single subcutaneous injection of meloxicam (0.5 mg/kg BW) or an equal volume of placebo solution. Meloxicam appeared to facilitate convalescence since pedometer data indicated that these calves displayed more resting behaviour during the first two days after developing diarrhea and then became more active in the subsequent three days ($p<0.05$).

Similarly, meloxicam-treated calves displayed greater appetites, in terms consumption of milk ration (*p=0.020*). This benefit carried over beyond the convalescent period with meloxicam-treated calves initiating starter consumption five days earlier than placebo-treated calves (*p=0.003*), they consumed 12.2 kg more starter ration during the 8-week study period, gained 4.3 kg more body weight during this period (*p=0.006*) and weaned earlier (*p=0.012*). Feasibility of NSAID treatment will ultimately depend on food animal drug approval and economic analysis.

Last, culling and euthanasia are important components for addressing the welfare of compromised cattle, particularly where treatment options are not viable. Compromised animals are also particularly vulnerable to the stressors of transportation, novelty and social mixing during this phase of the production cycle. There have been some excellent publications that have recently been produced with decision trees to assist producers responding to compromised cattle (ie: Ontario Farm Animal Council 2005).

In an Alberta, Canada report, producers estimated that their cull dairy cows would be slaughtered within 1.5-24 hours after shipping, but in reality cows may spend three weeks in transit between livestock markets before reaching a slaughter facility (Alberta Milk and Alberta Farm Animal Care Association, 2002). Dehydration, injury due to fighting and exhaustion are risks to healthy beef cattle during transit from ranch to slaughter, particularly those that move through markets prior to reaching their destination (Jarvis et al 1996). Furthermore, few animals lie down and rest even during 24 hours of lairage affecting the ability of cattle to cope with multiple stressors (Cockram 1991). Compromised animals require additional care during handling, taking more time to move, non-slip floors to address their lack of balance and strength and planning to limit the amount of locomotion required to move to the holding pen or stun box. Hence, there is a need for well designed facilities and for communication between packers and producers to ensure direct processing of at risk cattle and consequently minimize the risk of cattle becoming non-ambulatory during the final stages of production.

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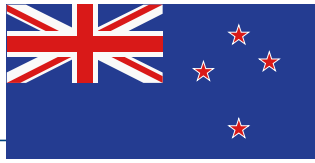
Prof. Kevin J. Stafford

Kevin Stafford is Professor of Veterinary Ethology in the Institute of Veterinary Animal and Biomedical Sciences at Massey University, Palmerston North, New Zealand.
He is a farm animal veterinarian with a specialist interest in animal behaviour and welfare. Kevin was born on a mixed farm in Ireland and graduated from the Veterinary College in Dublin in 1976.
He gained an MSc in tropical animal health and production from the University of Edinburgh in 1977. He spent 10 years working in the Yemen, Belize and Zambia. He was awarded a PhD by the National University of Ireland in 1988. He arrived in New Zealand in 1990 and initially taught sheep and beef medicine at Massey University.
He began teaching animal behaviour and welfare in 1991.
Kevin is a Member of the Australian College of Veterinary Scientist in Animal Behaviour and Animal Welfare.
He is a registered specialist in animal behaviour in New Zealand.
He has carried out research into different aspects of behaviour and welfare in a number of species and has published about 180 papers in refereed journals. He has supervised many graduate students.
At present he teaches animal behaviour and welfare to veterinary, agriculture and science undergraduates and is supervising 4 PhD and about 4 MSc students. He was awarded a Fellowship of the Royal College of Veterinary Surgeons for his work on pain in cattle. Kevin has a small farm with sheep and beef cattle and sometimes deer.
In his spare time he fishes and hunts. Kevin's wife Yvonne is a veterinarian. They have three children, his two sons are rural bankers and a daughter who is a dietician.



Physiological measurement of distress following husbandry procedures in beef cattle

Prof. Kevin J. Stafford
Welfare, Science and Bioethics Centre, Massey University, NZ

The distress caused by routine husbandry procedures can be assessed using physiological responses. Physiological stress can be elicited by unpleasant experiences which are emotional or physical or a mixture of both. The distress caused by routine husbandry procedures includes emotional (fear, pain) and physical (exercise) facets. The level of distress is assessed by variables used to measure physiological stress and may be described as “minor”, “moderate”, “marked” and “extreme”. The pain component can be assessed using physiological variables and or behaviour in experimental protocols which include treatments with effective pain relief by local anaesthetic and/or systemic analgesia (Figure 1). Changes in these variables are objective measurements but any conclusions about the subjective experiences that cause those changes remain judgements and not statements of fact. That is because without a common language an animal cannot tell us how painful or pleasant a particular experience is.

The physiological parameter used to determine relative levels of pain are direct or indirect measures of the sympathetic adrenomedullary system (SAMS) (e.g. adrenaline, noradrenaline, heart rate or characteristics), or the hypothalamic pituitary adrenocortical (HPA) system (e.g. corticotrophin releasing hormone, adrenocorticotropic hormone cortisol). In isolation these indices do not measure pain per se but do provide an indication of the overall negative experience including emotional and physical components. In a defined protocol as shown in Figure 1 the difference in response between an animal subject to the painful experience (dehorning) and that following anaesthetic/analgesic provide an indication of the significance of the pain. If the plasma cortisol response to a painful procedure is prevented by an analgesic protocol then the pain caused by that procedure is virtually eliminated. The response time of the HPA axis makes it unsuited to distinguish between the different levels of distress elicited in the first few minutes after the unpleasant experience and changes in the SAMS may be more useful during that time.

To date most assessments of the distress (pain) caused by painful husbandry procedures in livestock have been conducted using behaviour and plasma cortisol concentrations. Behaviour is a valuable index of distress because pain-related behaviours can be good indices of the duration and the different phases of an experience. However, behavioural changes are often poorly correlated with the maximum intensity of the noxious experience as indicated by physiological variables (Mellor et al., 2000). The discussion

of responses to dehorning and disbudding provided in this paper is therefore based primarily on the acute cortisol response. The strengths and weaknesses of this approach have been explored in detail elsewhere (Stafford and Mellor, 1993; Mellor and Stafford, 1997; Mellor et al., 2000).

Control animals	handled like calves that are dehorned
Anaesthetic/Analgesic control	given the anaesthetic/analgesic but not dehorned
Dehorned	horns amputated
Analgesic and dehorned	given the anaesthetic/analgesic and then horns amputated
ACTH control	given ACTH to determine maximum cortisol response

Figure 1.
A typical protocol using a number of treatments, to determine the relative levels of acute pain caused by dehorning using changes in plasma cortisol concentrations as the variable measured.

In New Zealand beef cattle are subjected to several painful husbandry procedures including castration, disbudding/dehorning, ear-tagging and ear-notching. Hot branding is rare as is spaying. About half the male animals slaughtered are intact bulls from the dairy industry. Most beef calves are castrated under 3 months of age by rubber ring and a smaller proportion are castrated surgically at about 4 months of age (Stafford et al., 2000a). There are no figures for disbudding or dehorning but Aberdeen Angus cattle, the dominant beef breed, are polled as are many Herefords. The Friesian bull calves which are reared for beef are usually disbudded early in life and those that are not disbudded are probably dehorned by scoop before 6 months of age.

We use plasma cortisol responses and behaviour to assess the pain caused by disbudding/dehorning and castration and its alleviation by local anaesthesia and systemic analgesia. During the last 15 years the pain-induced distress caused by disbudding, dehorning and castration in calves and different strategies for its alleviation, have been investigated in our laboratory (Petrie et al., 1995; 1996; McMeekan et al., 1997; 1998a, b, 1999; Sylvester et al., 1998a, b; Stafford et al., 2000a,b, 2002,2003, 2005a,b,c) and elsewhere (Earley and Crowe, 2002; Fisher et al., 1996, 2001; Graf and Senn, 1999; Kent et al., 1996; Molony et al., 1995; Robertson et al., 1994; Knight et al., 2000). The results of this research are presented here in a series of short paragraphs. More detailed results can be found in the relevant reviews.

Amputation Dehorning

(see review Stafford and Mellor, 2005a)

Amputation dehorning causes a marked cortisol response which lasts 7 to 9 hours, and the magnitude of that response is not influenced by either the amputation method or the depth of the amputation wounds. Dehorning calves and then cauterising the amputation wounds reduces (but not significantly) the acute cortisol response to treatment. Additional struggling by the calf during the wound cautery is marked. Prior injection of short-acting (lignocaine) or long-acting (bupivacaine) local anaesthetic prevents both behavioural and cortisol responses during the period of nerve blockade, but once


the local anaesthetic wears off pain-related behaviours and a marked cortisol response occur. These local anaesthetic strategies do not usually reduce the overall cortisol response to dehorning, they merely delay it.
Prior injection of the non-steroidal anti-inflammatory drug (NSAID) ketoprofen does not affect the acute cortisol response during the first 2 hours after horn amputation, but it virtually abolishes the last 5 to 7 hours of it. Prior injection of both lignocaine and ketoprofen virtually abolishes the cortisol distress response to horn amputation throughout the first 9 hours after treatment. Injecting lignocaine before dehorning and then cauterising the amputation wounds virtually abolishes the acute cortisol response throughout the first 9 hours after treatment. Xylazine reduced the initial cortisol response to amputation dehorning but not as much as when local anaesthetic is given. Xylazine had a short analgesic effect that lasted less than 3 hours. Calves graze less during the day following dehorning suggesting that they experience some pain for up to 48 hours after dehorning.

Cautery disbudding

(see review Stafford and Mellor 2005a)

Cautery disbudding causes a significant but short-lived cortisol response which is largely complete by 2 hours after treatment. Prior injection of short-acting local anaesthetic (lignocaine) causes a small but non-significant reduction in the acute cortisol response, but virtually abolishes struggling and other escape behaviours during the cautery itself. The acute cortisol distress response to cautery disbudding is much smaller than that caused by amputation dehorning.

Castration

(see review Stafford and Mellor 2005b)

All methods of castration caused a significant but short lived cortisol response which was complete by 2.5 hours following ring and band (tight ring) castration, 3 hours following surgical castration when the spermatic cords were broken by traction and 1.5 hours following clamp (Burdizzo) castration. Band castration caused a greater cortisol response than ring castration. The cortisol responses to ring and band castration were eliminated by local anaesthetic given intra-scrotally and intra-testicularly. The cortisol response to surgical castration, by traction on the spermatic cords or by cutting across them with an emasculator, was not diminished by local anaesthetic. When local anaesthetic and ketoprofen were given the cortisol response to surgical castration was eliminated. Clamp (Burdizzo) castration caused the smallest cortisol response which was reduced or eliminated by local anaesthetic, or local anaesthetic plus ketoprofen respectively, but this method of castration was not always successful.

Chronic Pain

It is difficult to measure long term pain in animals. The behaviour of calves suggests that they may experience pain for some weeks following castration but this may have been due to irritation rather than pain. Plasma cortisol levels remained elevated for 2 weeks in calves following surgical castration which may indicate ongoing pain. In contrast, there were no significant changes in pain threshold following ring castration or scoop dehorning suggesting that chronic pain is not substantial in calves following dehorning or castration. Wounds heal rapidly

following surgical castration (4 weeks) but slowly after ring castration (7 weeks).

Future

There are two major issues around the control of pain in cattle; one is whether alleviation of acute pain is acceptable or elimination is required and two is the difficulties of understanding chronic pain. At present it is technically easy to eliminate pain following disbudding, dehorning and castration using a combinations of local anaesthesia and long acting non-steroidal anti-inflammatory drugs. However the feasibility of using these drug combinations is made difficult by the logistics of drug delivery, the legal issues surrounding the availability of these drugs to farmers, the scarcity and expense of veterinarians, the low value of individual animals, and the cost of pain elimination. The use of NSAIDs alone will alleviate inflammatory pain but not eliminate acute pain caused by castration or dehorning. It is easier and quicker to inject an NSAID intramuscularly than to administer local anaesthetic. Research should focus on how to produce systemic analgesics that effectively eliminate acute and chronic pain following topical or systemic rather than local administration.

Conclusions

The pain induced distress caused by disbudding, dehorning and castrating calves and its alleviation has been measured by changes in plasma cortisol concentrations and behaviour. Cautery disbudding causes a significantly smaller cortisol response than amputation dehorning. The cortisol responses to both procedures are virtually eliminated when both local anaesthetic and NSAID are administered beforehand. The method of castration influences the volume and duration of the plasma cortisol response. Local anaesthetic virtually eliminated the cortisol response to ring castration but had little effect on the cortisol response to surgical castration unless combined with an NSAID when the response was virtually eliminated.

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Dr. Joep Driessen

In 1997 Jan Hulsen and I founded Vetvice veterinary consultancy bureau. We did many big projects in Holland with the national health service on IBR and Johnes disease and a big farmers project on how to keep your cows healthy. In Ireland I worked as a fertility vet and we did several road shows. In Saudi Arabia I worked on a big export project with 14.000 dairy cows for 2 times 3 months.
I was asked back for a special practical training program on claw health. In the mean time I studied marketing & communication.

To develop my marketing skills I did a 3 years job as interim product manager in a large pharmaceutical company in animal health.

In 2000 we started our first workshop CowSignals in The Netherlands. Since January 1st 2004 I am full time active with my hobby CowSignals: learning farmers and advisors about the body language of the cow.

January 1st 2007 we celebrated our 10 year anniversary with Vetvice. This date is also the start the new CowSignals training company of which I am owner director.

I also give lectures about marketing and advisory skills. Working with groups suits me. I like to get the best out of people. That's why I like my job as facilitator. It is al about practical and useful tips and trainings. Stimulating, confronting and motivating of people is were my power is. I also like to organize and arrange things to get a maximum effect.

Since October 1st 2006, I am the proud father of my daughter Teuntje Linge Driessen. Together with her and her mother Annelies Pernot we enjoy life every day.

CowSignals® read body language to improve health

Dr. Joep Driessen
VetVice, The Netherlands

How blind are we? What is normal?
What can we do about it?
We all know that farmers have a serious infection with owneritis. They don't see their own management-mistakes anymore. A level of blindness occurs.

But what about your own disease: Veterinarianitis? How blind are you?

In Holland we had to sign a paper when we graduated as veterinarians. We had to promise that we are taking care of the sake of man and animal. Keep them healthy. *Hominum animalium salutem*. If we look at our duty, how good do we support farmers in keeping their cows healthy? How busy are you with preventing disease? How busy are you with treating sick animals? I think everybody is trying to do the things right, but are you also doing the right things? Or can you do better?

In our workshop (3 hours in the barn) we train veterinarians in the field of CowSignals®.
We learn them more about the body language of the cow and learn them how to train farmers to use their common sense again. Our trainings are full of practical examples that can help you to successfully persuade farmers.

CowSignals® is a *keep it simple* approach on dairy management. After visiting many farms in 24 countries we found out what the *secret of success* in dairy farming is. The answers are dead-simple. Cows need a high amount of Feed, Water, Light, Air, Space and Rest. If you give it to them, they have no good reason to become ill anymore.

We call this the CowSignals approach (figure 1). These are the 6 freedoms of the pasture. Bring these freedoms also in the barn and you get a very disease resistant management.

Figure 1: CowSignals Diamond

On every dairy in the world, one of these points is the most critical for cow health and welfare and farmers income. Very often 3 or 4 of these items can be easily improved.

Feed: one feeding place per cow, 24 hours tasty feed available, easy access.
Water: one water tank with clean water per 20 cows (or 2 high pressure drinkers)
3 x per week cleaning with a brush.
Light: 16 hours 200 lux, 8 hours less then 50 lux. Dry cows less then 50 lux.
Air: prevent fresh air seeking behavior. Open sides. Fans on from 18 degrees centigrade.
Rest: quiet animal handling, 1 minute cubicles (=14 hours laying time): sand or deep straw bedding with head space up to 3,5 meter and a low rounded brisket locator (8 cm)
Space: in the cubicle, at the feeding table, in the passage (100 cows, 3 passages of 4 meters wide.
Light, Water and Air is the cheapest Feed...
Space and Rest will improve Feed intake as well.

Learn to look for Risk Animals, Waiting cows and UNO's. They will tell you what to do.
Any cow with a rumen score of less then 2,5 (danger triangle visible) is a cow in danger. You first see it, than you think about all the possible causes and improvement options, then you do something. Look, Think, Act.
A waiting cow in a cubicle tells you something: my bed is too hard or too short, I am lame, or there is not enough fresh, dry air in this building.

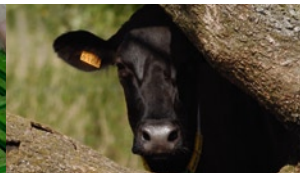
How big is the problem? Stand next to the farmer and judge the cows together with an open mind. Objective observation. Be honest. Look from large to little and from little to large. Why are 25% of all the cows in Europe and North America lame? This has a lot to do with cubicle design, flooring, ventilation, long waiting times at milking and transition period management. What about cows with wounds on knees, necks, backbones etc ? This varies a lot from farm to farm from no wounds till 44% wounded animals.

How can we bring the management knowledge from the top 5% farms in the country to the other 95%? You are the one that can make a difference!

We strongly advice fresh air, good beds and non-slipping floors. We also see big success with the Stress-Free-Calving-Line. This is a special facility were cows come in an area latest 10 days before calving, calve in the group or in a pen in the corner of the same group, and stay there in a fresh cow group at least till 10 days after calving. This fresh cow group is often combined with some lame cows to recover on the same straw pack. No stress, for cow and farmer. This area is preferably a free straw area (9000 liter cow: 9 squared meters of straw) or spacey sand cubicle area. Cows can eat, rest, calf and start up freely and easily. We promote a fresh cow group and or a heifer group. Success herds are very keen on claw health and do 2-3 x per year preventive hoof trimming by a specialist.

Investment in animal welfare pays back.
Farmers all over the world say the same thing:
I have no time and no money. The answer is simple: do these things that bring you time and money...
One hour extra lying time gives you one liter of milk per cow per day extra.
Healthy cows will save you a lot of time and money.

Read more about our lecture and trainings on **www.cowsignals.com** Our picture books on dairy management: CowSignals, Hooves, From calf to heifer, can be ordered on this website. Thank you for reading this. I wish you a lot of happy cows and happy farmers. Keep up the good work. See what you can do!

Notes

Dr. Raphaël Guatteo

After his graduation in 2001, Raphaël Guatteo has worked in a mixed practice before joining the National Veterinary School of Nantes. At Nantes, he's appointed as an assistant professor in the Department of Farm Animal Health and Public Health, to conduct clinical and research activities within population medicine area. His PhD focused on the epidemiology of Q fever in dairy cattle with a special interest on diagnostic tests and *Coxiella burnetii* shedding. His current research activities are now dealing with (i) the assesment of medical control measures to prevent and reduce *Coxiella* shedding under field conditions, (ii) the infection of dairy cattle by *Mycobacterium avium susbsp paratuberculosis* (Map) and (iii) the improvement of pain management in cattle practice to improve animal welfare.

Current attitudes of European veterinary practitioners toward pain and the use of analgesics in cattle

JN Huxley (UK), A Dalmau (Spain), P van Dijk (The Netherlands), M Gidekull (Sweden), **R Guatteo** (France), LJ Hellebrekers (The Netherlands), D Holopherne(France), A de Kruif (Belgium), X Manteca (Spain), KE Müller (Germany), B Ranheim (Norway), F Rollin (Belgium), O Svendsen (Denmark), K Touati (Belgium), S De Vliegher (Belgium), CN Weber (Germany), HR Whay (UK).

Introduction

Over the past decade, interest in the welfare of farm animal species has grown substantially, as a result the opinions of various stakeholder on farm animal welfare are being evaluated.
A number of recent papers have used questionnaires to assess the attitudes of both the public in The Netherlands (Boogaard et al., 2006) and Spain (Maria, 2006) and individuals working with in the food animal sector e.g. animal science students (Heleski and Zanella, 2006), animal science faculty members (Heleski et al., 2004, 2006), veterinary college faculty members (Heleski et al., 2005, 2006) and veterinary science students (Levine et al., 2005), toward farm animal welfare. One of the essential components of good welfare is the recognition and control of pain. Recent work has suggested that one of the key motivators for analgesic usage by veterinary practitioners is the attending clinician's own perceptions of the patients' suffering (Huxley and Whay, 2006b). Therefore, barriers to pain management may be identified and overcome through understanding the attitudes of veterinary practitioners towards pain and use of analgesics. In cattle, previous questionnaire surveys amongst veterinary surgeons have investigated treatment options during caesarian section (Mijten et al., 1996), the use of epidural anesthesia (Watts, 2000) and perception of pain (Fitzpatrick et al., 2002). These have been followed by two recent wider scale surveys investigating attitudes towards pain and the use of analgesics in the UK (Huxley and Whay, 2006b) and Canada (Hewson et al., 2007). This paper describes the result of a large scale survey conducted to investigate the attitudes of practicing veterinary surgeons towards pain and the use of analgesics in cattle from nine countries within Europe.

Materials and Methods

The questionnaire survey was conducted in two phases. Phase one took part in the autumn of 2004; 2391 questionnaires were distributed to veterinarians in Great Britain and Northern Ireland. The methodology employed when

conducting this initial phase of the study has been reported previously (Huxley and Whay, 2006b; Whay and Huxley, 2005). Phase two took place in the summer of 2006. A further 10373 questionnaires were distributed to veterinary surgeons in the following eight European countries: Belgium (250), Denmark (493), France (3120), Germany (3092), The Netherlands (797), Norway (387), Spain (1950) and Sweden (284). Within each country a local "expert" or "experts" were identified and invited to facilitate the survey. Distribution dates ranged between the middle of June to the middle of September 2006. No reminders were sent; questionnaires were accepted for three months following the date they were initially distributed.

The questionnaire collected information on the respondent's attitude towards pain and the use of analgesics in cattle. The initial section collected demographic data such as the country the respondent practiced in, gender, veterinary school attended, year of graduation, pre-veterinary school background (rural, urban or rural and urban), the respondent's practice (size, type and location), and the amount of time the respondent currently spent working with cattle. Respondents were then asked to state which non-steroidal anti-inflammatory drugs (NSAIDs), α_2 adrenoceptor agonists, local anaesthetics and other analgesic agents were available in their practice which they used when treating cattle or calves. Following this respondents were asked to rate a series of factors relating to NSAIDs, α_2 adrenoceptor agonists and local anaesthetics when they considered their use in adult cattle. The rating scale respondents were asked to select from was "Not Important", "Fairly Important", "Quite Important" or "Very Important". The next sections of the questionnaire asked about the drug regimes' the respondent would use to provide analgesia for a selection of procedures and conditions in adult cattle and calves and how severe they estimated the pain associated with a range of procedures and conditions conducted on or suffered by adult cattle and calves would be if *no* analgesic agents at all were administered. Pain severity was estimated on a ten point scale were "1" was no pain at all and "10" was the worst pain imaginable. The final sections of the questionnaire asked whether the respondent agreed with a number of statements relating to the use of analgesics in cattle and investigated their views about their current level of knowledge in the area. All responses were anonymous; no information about the identity of individual respondents was collected.

Questionnaires from the eight countries who participated in phase two of the study were collated centrally. Data from returned questionnaires were entered into an Excel 2003 spreadsheet using a template developed previously for the UK data. Data entry was audited using a number of check methods to identify errors. The number of errors identified after the initial audit was considered unacceptably high; as a result, every single data entry point was rechecked manually and corrected where appropriate. After rechecking, data from phase two of the study and the data generated during phase one of the study were merged into a final dataset. The complete dataset was manipulated and analysed using Access and Excel 2003 (Microsoft Corporation).


Results

Availability of Analgesic Agents

When asked to list the NSAIDs available in their practice which they used when treating cattle or calves, respondents quoted between zero and eight agents with a median of three. Flunixin, meloxicam and ketoprofen were the most commonly quoted agents, all named by more than one thousand respondents. A total of nine agents were quoted. The number of α_2 adrenoceptor agonists available ranged from zero to four with a median of one agent. Xylazine was the most commonly quoted agent. The number of local anaesthetic agents available also ranged from zero to four with a median of one agent. Lidocaine and procaine were the most commonly quoted agents, both named by more than one thousand respondents.

Clinical Use of Analgesic Agents

The proportion of respondents who stated they used NSAIDs, α_2 adrenoceptor agonists and local anaesthetics during the treatment of a range of procedures and conditions of adult cattle and calves are outlined in Table 1. The proportion of respondents who stated they never used analgesic agents for a procedure or condition ranged from 1% for caesarean section to 41.3% for dystocia in adult cattle and from 2.9% for umbilical hernia surgery to 55.1% following dystocia in calves.

			Proportion (%) of respondents who stated they used the following agents in ***some*** cases			
	Procedure / Condition	**n**	**NSAID**	**α_2 Agonist**	**Local Anaesthetic**	**None Used**
Adult Cattle	Treatment of a sole ulcer	2603	50.7%	17.1%	21.5%	33.1%
	Claw amputation	2512	55.5%	65.0%	85.5%	1.1%
	Caesarean Section	2626	37.7%	49.1%	96.9%	1.0%
	Dystocia[1]	2589	43.5%	7.4%	25.4%	41.3%
	Dehorning[2]	2622	9.2%	57.7%	83.8%	5.8%
	Uveitis	2355	48.8%	8.0%	26.8%	30.2%
	Debriding a digital dermatitis lesion	2476	25.9%	36.1%	44.8%	28.0%
Calves	Surgical castration	2504	17.6%	66.0%	67.7%	12.3%
	Joint ill[3]	2576	86.1%	6.8%	7.8%	8.6%
	Umbilical hernia (surgery)	2547	42.8%	82.4%	62.1%	2.9%
	Disbudding	2546	9.0%	52.2%	66.9%	11.7%
	Distal limb fracture	2521	66.0%	51.7%	6.3%	10.9%
	Following dystocia[4]	2481	42.6%	1.7%	2.0%	55.1%

Table 1
Proportion of respondents who stated they used analgesic agents for the treatment of some cases of a series of procedures / conditions of adult cattle and calves.

[1] *Fetal-maternal disproportion requiring traction alone*
[2] *Horns >8 cm / 3"*
[3] *Septic arthritis*
[4] *A calf delivered after fetal-maternal disproportion requiring traction alone*

Pain Assessment

The estimated pain scores (median, interquartile range and mode) for a number of procedures and conditions of adult cattle and calves are outlined in Table 2. The estimated pain scores for all the procedures and conditions quoted ranged across the whole scale i.e. 1 to 10. Based on the median results, mastitis (with clots only) and neck calluses (score 3) were considered the least painful and claw amputation (score 10) the most painful procedure or condition of adult cattle.

Table 2
Median, range, quartiles and mode values of the estimated severity of pain associated with a number of procedures and conditions in cattle.

		Median	Q1	Q3	Mode
Adult Cattle Procedures	Treatment of a sole ulcer	6	4	7	7
	Claw amputation	10	9	10	10
	Caesarean section	9	7	10	10
	Dystocia[1]	6	5	8	5
	Dehorning[2]	8	6	9	10
	Debriding a digital dermatitis lesion	6	5	8	7
	LDA surgery	6	5	8	7
Adult Cattle Conditions	Uveitis	7	5	8	8
	Fracture of tuber coxae	7	6	9	8
	LDA	4	3	6	3
	Digital dermatitis	6	4	7	5
	Acute metritis	5	3	6	3
	Swollen hock	5	4	7	5
	Hock with hair loss	4	2	6	2
	Acute toxic *Escherichia coli* mastitis	7	6	9	8
	Mastitis (clots in milk only)	3	2	4	2
	Neck calluses	3	2	4	2
	White line disease with sub-sole abscess	7	5	8	8
Calf Procedures	Calf castration (Surgical)	8	6	10	10
	Calf castration (Rubber ring)	6	4	8	8
	Calf castration (Burdizzo)	8	6	9	10
	Umbilical hernia surgery	8	7	10	10
	Disbudding	7	6	9	10
Calf Conditions	Distal limb fracture	8	7	9	10
	Following dystocia[1]	5	3	6	5
	Umbilical abscess	6	4	7	5
	Joint ill	7	6	8	8
	Pneumonia	6	4	7	7

[1] *Fetal-maternal disproportion requiring traction alone*
[2] *Horns > 8cm / 3”*


Attitudes towards Analgesics and their use in Cattle

Generally the principal pharmacological effects and licensing for food animals were considered the most important and practice purchasing policy and relationship with company representative the least important factors (Table 3).

Views about Their Current Level of Knowledge

Forty seven point nine percent (1251 of 2610) of respondents considered their knowledge of pain relief in cattle was adequate. When asked to state where they had gained most of their knowledge on recognising and treating pain in adult cattle and calves the highest proportion of respondents stated "Experience gained in practice" (56.7%, 886 of 1563) followed by "Journals and articles (14.0%, 219 of 1563), "Undergraduate training at veterinary school" (13.9%, 217 of 1563), "Continuing education lectures" (8.9%, 139 of 1563), "Commercial literature / data sheets" (5.2%, 81 of 1563) and "Other sources" (1.3%, 21 of 1563).

	Median Response[a]	Mean Response[a]	Rank Position
Anti-inflammatory effects	4	3.7	1
Analgesic potency	4	3.6	2
Anti-toxic effects	4	3.6	3
Licensing for food animals	4	3.5	4
Duration of analgesia	3	3.4	5
Time to onset of drug activity	3	3.0	6
Cost	3	2.8	7
Potential side effects	3	2.5	8
Route of administration	3	2.5	9
Dose volume	2	2.4	10
Availability of product support	2	2.3	11
Lack of sedative effect	2	2.1	12
Practice purchasing policy	2	2.0	13
Relationship with company representative	2	1.9	14

Table 3 Importance of a series of factors when considering the use of NSAIDs in adult cattle.

[a] 1 – Not Important; 2 – Fairly Important; 3 – Quite Important; 4 – Very Important

Discussion

This paper describes the largest survey ever conducted into the attitudes of veterinary practitioners towards pain and the use of analgesics in cattle and draws together the opinions of clinicians from nine countries across Europe. Almost thirteen thousand questionnaires were distributed; the overall response rate achieved for this type of survey amongst clinicians was moderate (21.3%; c.f 50.1% (Hewson et al., 2007), 49.9% (Hugonnard et al., 2004), 48% (Capner et al., 1999)) and varied considerably between countries.

It is disappointing to note that only two thirds of respondents consider using local anaesthetic for surgical castration and disbudding of calves and

even these clinicians only use local anaesthetic in some cases. The proportion of vets using analgesia for these procedures is similar to that reported for practitioners in Canada for disbudding and significantly higher for castration (Hewson et al., 2007). However, it is still of concern considering the wealth of information currently available on the pain caused by these procedures and the methods available to control it (Stafford and Mellor, 2005a, b). It is also surprising to note that a significant minority of respondents stated they never used local anaesthetic whilst performing the major surgical procedures of claw amputation (14.5%), caesarean section (3.1%) and de-horning (16.2%). Possible explanations for these findings are that respondents performed these procedures under general anaesthesia or misunderstood the question. However it is unlikely that these explanations account for all the responses given.

Performing surgical procedures such as these without the use of any anaesthesia or analgesia is entirely unacceptable against the back drop of our current levels of understanding and the availability of inexpensive and cost effective agents. Equally, only a small proportion of clinicians use NSAIDs following surgery such as caesarean section (38%), claw amputation (56%), dehorning (9%), umbilical hernia surgery (43%) and surgical castration (17.6%) and again, not in all cases. NSAIDs have potent analgesic properties; they have been shown to significantly reduce the cortisol response induced by castration (Earley and Crowe, 2002), and disbudding (McMeekan et al., 1998) and prevent the development of hyperalgesia caused by lameness (Whay et al., 2005). The levels of use in cattle are lower than those reported for similar procedures in small animals (Capner et al., 1999; Dohoo and Dohoo, 1996; Hugonnard et al., 2004), although levels for surgical castration appear similar.

It is apparent that the current management of pain in cattle lags behind that of companion animals. In fact when discussing the use of analgesia in dairy cattle one recent author stated "... for reasons of animal welfare and professional ethics, it remains a grave concern that so many veterinarians provided either no analgesia or inadequate analgesia to animals under their care" (Leslie, 2007).

Whilst estimated pain scores are subjective assessments, the data reported here represents the opinions of over two and a half thousand veterinary surgeons from across Europe. Few other groups within the population are better qualified to make this form of assessment. In order to gauge the level of pain an animal is suffering it is likely that clinicians draw on their experience of assessing a range of indicators including behaviour, posture, demeanour and clinical findings and their knowledge of physiology and pain mechanisms. Additionally it is likely that they consciously or subconsciously draw on their experiences treating other less stoical species with similar conditions which demonstrate more overt behavioural indicators of suffering and their own personal experience of analogous or related conditions.

Across the range of adult conditions and procedures specified mastitis and neck calluses were considered the least painful (median score 3) and claw amputation the most painful (median


score 10). These results are similar to those reported previously for a cohort of practitioners based in the UK (Huxley and Whay, 2006b). The median score given for the range of procedures and conditions of calves was much less varied. This lack of variation in median pain scores may reflect the conditions specified in the questionnaire. Alternatively this could reflect the view that young animals do not feel pain in the same way as adults. Surgical procedures were generally considered to be most painful. In fact the modal pain score for claw amputation, caesarean section, dehorning, surgical castration and umbilical hernia surgery were all 10 despite the median pain scores being 10, 9, 8, 8 and 8 respectively. These data provide more evidence that the use of appropriate and effective anaesthesia and analgesia regimes for these procedures are vital. Interestingly LDA surgery was considered much less painful (median score 6, mode score 7).

When asked to consider a range of factors relating to their use of analgesic agents in adult cattle respondents regarded pharmaceutical properties and whether products were licensed for food producing animals as the most important. Despite "Licensing for food animals" being considered very important it is noteworthy that large numbers of clinicians quoted unlicensed products when they were asked to state what agents they had available for use in cattle. This is particularly true for local anaesthetics where lidocaine was the most frequent response, quoted by 1643 respondents, despite it no longer being licensed for food producing animals within the European Union. It is very important that clinicians operate within the confines of current legislation in order to instil confidence in the food chain and protect the consumer. However, it is of concern that this licensing issue is currently interfering with the ability of practitioners to provide appropriate anaesthesia for animals under their care without being forced to break current legislation in areas of Europe where no other licensed local anaesthetic is available.

It is concerning that less than fifty percent of respondents considered that they had adequate levels of knowledge in the field. This is especially true considering that 57% of respondents stated that they had gained most of their knowledge from "Experience gained in practice". The danger with this approach is that their attitudes and opinions may be unwittingly out of step with current scientific knowledge (Huxley and Whay, 2006b). It is vital that clinicians and researcher workers based within academic institutions across Europe educate undergraduate veterinary and animal science students appropriately, disseminate current scientific knowledge, promote up to date therapeutic protocols and ensure legislation develops to reflect our current understanding so that we ensure the welfare of the animals submitted to our care.

Conclusion

The results generated from this study suggest that there are currently two principal factors hindering the use of analgesics in cattle: the limited number of analgesics (particularly local anaesthetics) licensed for use in food animal species in Europe and the belief amongst many practitioners that they have an adequate knowledge of pain management despite the fact that their use of analgesics in cattle is often limited. This indicates that for improvement in animal welfare to be made measures should be taken to drive changes in the regulation and licensing of European pharmaceutical and improve the education and training of undergraduates and practicing veterinarians on pain management.

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Notes

Dr. Todd F. Duffield

Todd graduated from the Ontario Veterinary College (OVC) in 1990 (DVM) and worked for 4 years in a large dairy practice in eastern Ontario, Canada. He returned to OVC in 1994 and completed a Doctor of Veterinary Science (DVSc) degree in 1997.
He is currently an associate professor in the Department of Population Medicine, OVC, University of Guelph. Todd's time is split approximately 50% for teaching and 50% for research. He teaches in all years of the undergraduate veterinary program and works 1 to 2 days per week in the OVC ruminant field service veterinary practice. He is actively involved in dairy research, graduate supervision and teaching. He has authored or co-authored over 60 peer-reviewed articles on several aspects of dairy health management including transition cow metabolic disease, use of monensin in dairy cattle, Johne's disease, Neospora abortion, and strategies for minimizing pain during and after dehorning dairy calves. Todd was on sabbatic leave with Ian Lean at Strategic Bovine Services in Camden, Australia in 2007 working on a meta-analysis of monensin research in dairy cattle.

Current Welfare Attitudes, Knowledge and Practice amongst Canadian Dairy Veterinarians

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Introduction

There is a growing awareness and interest in the welfare of food animals worldwide. Recently, there have been a number of papers published describing attitudes and practices for pain management in food animals. In Canada, researchers surveyed food animal veterinary attitudes with respect to analgesia (Hewson et al, 2007a,b). In another paper, both dairy producers and veterinarians were surveyed concerning their approaches to the use of anesthetics, and analgesia in general (Misch et al., 2007). This manuscript briefly reviews the findings of these previous authors, and describes the current exposure of Doctor of Veterinary Medicine (DVM) students to food animal welfare considerations through their four year curriculum at the Ontario Veterinary College (OVC). In addition, recent directions of welfare research in food animals, as well as collaborations between welfare/behaviour science and epidemiology at OVC are described.

Results from recent Canadian surveys

1. Analgesia use in Food Animals (PEI survey – Hewson et al, 2007a,b)

and

2. Dehorning practices in Ontario – Veterinarians and Dairy producers (Misch et al, 2007)

Two surveys of dairy veterinarians' and producers' usage of analgesics for dehorning have recently been completed in Canada (Hewson et al, 2007b; Misch et al, 2007). These surveys provide insight into both veterinary and producer usage of various methods of achieving analgesia for dehorning, and general attitudes toward their use. In addition, a second paper from the PEI survey was published that probed veterinary analgesia use in Canada for other surgical interventions including castration (Hewson et al, 2007a).

The surgical procedures and medical conditions that were examined in the PEI survey were chosen because of their certainty of being painful. The results showed that not all veterinary respondents elected to manage the pain in question. However, almost all respondents provided some form of analgesia to cattle for the most invasive surgeries, and the dehorning of dairy calves. The high use of analgesics for all these surgeries would have benefited the animals concerned, even if a primary reason for providing analgesia may have been to keep the animal still and thereby protect the veterinarian. This legitimate motivation is suggested by the respondents' strong agreement that using analgesia made it safer to work with the species concerned (Hewson et al, 2007a). This notion is also supported by the almost universal use of xylazine, not lidocaine, as the most commonly used drug for calf castrations. In the dehorning survey by Misch et al (2007), owner/animal safety and restraint were major reasons for both xylazine and lidocaine use for dehorning calves amongst veterinarians. However, the benefit to animals of the high levels of analgesic usage is unlikely to have been optimal because most of the users employed only 1 analgesic drug. The practice of the sole use of one product could not mitigate pain adequately, because of the nature of the pain pathway and the short duration of action of the most common drugs that were used, such as lidocaine (Hewson et al, 2007a). The sole use of other drugs to mitigate pain (i.e. NSAID's, butorphonol, or xylazine) would not have provided effective perioperative analgesia in most cases.

Few veterinarians reported not using analgesia to all cows for the invasive surgical procedures of Caesarean section, omentopexy, and claw amputation (Hewson et al, 2007a). Despite this finding, it is quite disconcerting that there were any veterinarians at all that did not use analgesia for any of the 3 surgeries.

The dehorning survey by Misch et al (2007) probed both veterinarians and dairy producers in Ontario. It was found that 92% of veterinarians used lidocaine for dehorning, which is similar but a bit higher than that reported (85%) by Hewson et al (1997b). However, 78% of Ontario producers dehorn their own dairy calves, and of those individuals only 22% used anesthetic (Misch et al, 2007).

The Canadian survey data suggest that a minority of respondents met the UK recommendations for dehorning or castrating calves. The greater use of xylazine for castrations, rather than lidocaine, may have arisen because of concern about the cost of the time needed for local anaesthetics to take effect. Moreover, although respondents did not generally use ketoprofen or other NSAIDs in calves for castration or other surgeries, they disagreed that NSAIDs pose substantial health risks in cattle. Respondents were neutral about whether cost prevented them from using analgesic drugs, but agreed that there are not enough

cost-effective long-acting analgesic drugs that are approved for use in food-producing animal species. In the absence of concerns about risks to cattle, this suggests that cost may have dissuaded veterinarians from using ketoprofen in calves. In the dehorning survey reported by Mish et al (2007), cost was reported as both a reason to use and a reason not to use lidocaine for dehorning by both producers and veterinarians, suggesting that cost can be perceived as both a limitation and an advantage depending on perspective. Since lidocaine itself is relatively inexpensive, it is very likely that it is the perceived cost and time of actually doing the cornual nerve block that leads to the notion that it is prohibitive. In fact, in the survey by Misch et al (2007) time was considered another strong reason for not using lidocaine.

There are a number of conclusions made in the paper by Hewson et al (2007a) that are worth highlighting, such as:

1. Continuing education programs about pain management in cattle should be made widely available to veterinarians, through regular regional or local lectures and wet labs, and through the publication of review articles.
2. More cost-effective analgesics, with shorter withdrawal periods, should be developed and approved for use in food animals, so that multimodal analgesia is more feasible.
3. The regulatory system should be reviewed and revised in order to streamline the approval process to facilitate the use of longer-acting analgesic drugs in young animals that are not going to be part of the human food supply until they are much older.
4. The cost of pain relief in food animals should be incorporated into current food policy, rather than remaining one of many extrinsic costs of food provision.

Further, the paper by Misch et al (2007) found that veterinarians may be influenced by their staff, since veterinarians working in clinics that utilized technicians for dehorning were far more likely to use lidocaine for dehorning. In addition, producers who sought veterinary advice for dehorning were much more likely to use lidocaine when they dehorned their own calves. It would seem then that education for both producers and veterinarians on pain management will be beneficial.

Welfare in the DVM curriculum at OVC

The curricular content of animal welfare and ethology that is being taught as a component of the DVM program at OVC is increasing.
A restructured series of courses called Health Management (I, II, III) contain elements of food animal welfare, integrated with blocks of material on each major animal species, public health, and epidemiology. Health Management is defined as the promotion of health, improvement of productivity, and prevention of disease in animals within the economic framework of the owner and industry, while recognizing animal welfare, food safety, public health, and environmental sustainability (Leblanc et al, 2006). As such, the definition of Health Management includes animal welfare as one of its core elements. Welfare continues to be addressed in senior year in specific rotations. Recently, there have been electives offered in welfare for interested students. Also, in the ruminant health management rotations, students are specifically taught techniques such as cornual nerve blocks for dehorning dairy calves, current roles and understanding of NSAID use, timely management (and euthanasia) of downer cows, therapy for chronic lameness, etc. In addition, there is a strong

emphasis on prevention of disease. The on-label use of therapeutics is greatly encouraged, as is the food safety responsibilities of veterinarians, as well as both the merits and cautions of extra-label drug use.

Food animal welfare reasearch at OVC

– finding synergy between epidemiology and ethology

The Department of Population Medicine has been very fortunate over the past several years to have a faculty member in the department who is trained in ethology and animal welfare. This has created a strong synergism for research across species in the welfare field. Our dairy research team has been a beneficiary of this excellent collaboration. Examples of this collaboration include the producer/veterinary dehorning survey (Misch et al, 2007), trials assessing the role of meloxicam at dehorning for pain management in addition to lidocaine (Heinrich, 2007), and the use of meloxicam as an adjunct therapy in cases of neonatal calf diarrhea complex (Todd, 2007). On the epidemiology and health management side, there is a collective experience with working in the field, collecting field level data and a strong understanding of both practitioner and producer concerns and limitations. The ethology expertise has highlighted the welfare issues and concerns more prominently, and added strong scientific methodology and ideas that have complimented traditionally strong epidemiologic analytic approaches. Furthermore, both parties have unique contacts that have led to excellent funding opportunities for welfare research. It is our ongoing mission to conduct research that addresses specific practical welfare needs on-farm. We wish to directly impact daily routine in ruminant practice. In addition to the dehorning and diarrhea projects, we currently have active research in free choice milk feeding of calves and calving pain management.

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Notes

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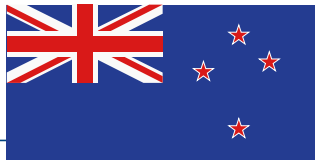
He is a farm animal veterinarian with a specialist interest in animal behaviour and welfare. Kevin was born on a mixed farm in Ireland and graduated from the Veterinary College in Dublin in 1976.
He gained an MSc in tropical animal health and production from the University of Edinburgh in 1977. He spent 10 years working in the Yemen, Belize and Zambia. He was awarded a PhD by the National University of Ireland in 1988. He arrived in New Zealand in 1990 and initially taught sheep and beef medicine at Massey University.
He began teaching animal behaviour and welfare in 1991.
Kevin is a Member of the Australian College of Veterinary Scientist in Animal Behaviour and Animal Welfare.
He is a registered specialist in animal behaviour in New Zealand.
He has carried out research into different aspects of behaviour and welfare in a number of species and has published about 180 papers in refereed journals. He has supervised many graduate students.
At present he teaches animal behaviour and welfare to veterinary, agriculture and science undergraduates and is supervising 4 PhD and about 4 MSc students. He was awarded a Fellowship of the Royal College of Veterinary Surgeons for his work on pain in cattle. Kevin has a small farm with sheep and beef cattle and sometimes deer.
In his spare time he fishes and hunts. Kevin's wife Yvonne is a veterinarian. They have three children, his two sons are rural bankers and a daughter who is a dietician.



Advances in Animal Well-being in New Zealand

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New Zealand is an island country in the south–west Pacific Ocean. It is 270,500 sq km. Its climate is temperate in the south and subtropical in the north. Extremes of climate are unusual. The principal exports are dairy products, meat (lamb, mutton, beef, and venison), forest products, machinery, fruit and fish. There are 4 million people, 5.15 million dairy cattle, 4.45 million beef cattle, 40 million sheep and 1.7 million farmed deer in New Zealand. Most of its livestock products are exported. As an example New Zealand produces 1% of the worlds beef (700,000 tonnes/year) but exports 82% of it which makes up 7.5% of world beef exports.

Livestock (ruminant) products, principally milk and meat, make up about 40% of the country's exports and so the economy is sensitive to the factors that affect world trade in milk, meat and wool. The factors that influence New Zealand's place in the world trade of these products include demand, competition from countries where farmers are subsidised, transport costs, consumer requirements and trader control of markets. New Zealand farmers are not subsidised by government and so are open to world prices. As New Zealand is primarily an exporter of primary products it is subject to the demands of importing countries. These traditionally have focussed on quality and public health issues.

Some European countries have tried to make animal welfare a trade issue and a potential non-tariff trade barrier. This has not happened but more importantly major grocery wholesalers and retailers use animal welfare issues as marketing tools, and non-governmental organisations (NGOs) have put pressure on retailers to only sell product that has been produced under 'acceptable' animal welfare conditions.

World demand for milk and meat is growing due to the increase in human population and wealth in developing countries, the impact of reduced farm support in the European Union, the use of grain for biofuels and reduced world food stocks. This may reduce some of the social pressure on animal production systems but there is likely to be an increase in pressure for agricultural sustainability and for minimising the climate effects of livestock production. These issues may become more important than animal welfare.

In New Zealand governments, academics and farmers are very aware of barriers to free-trade in milk and meat products and conscious of the problems that can develop from animal welfare issues. Therefore, for the last two decades they have developed animal welfare legislation and enforcement systems to pre-empt problems and to cope with the ongoing threat posed by

animal welfare. There is a section in the Ministry of Agriculture and Forestry devoted to animal welfare. An Animal Behaviour and Welfare Research Centre was established at Hamilton in 1991, a professorial chair in Animal Welfare Science at Massey University in 1994, and the Animal Welfare Science and Bioethics Centre at Massey University in 1998, all demonstrate concern about animal welfare. This paper will briefly review New Zealand research (Stafford et al., 2002) and legislation (Mellor and Bayvel, 2008) focussed on animal welfare.

Research

Ruminant livestock, are of great significance in New Zealand and animal welfare research has concentrated on their welfare, particularly in areas such as pre-slaughter stunning (see Blackmore and Delany 1988; Gregory 1998), alleviation of pain and distress caused by husbandry practices (Mellor and Stafford 2000), and welfare during transport (Black et al 1994; Todd et al 2000; Stafford et al 2001a). Efforts to conserve endemic fauna and flora have resulted in widespread poisoning and trapping programmes and led to concern about the effects on pests during trapping and poisoning. This concern has resulted in some significant research into the welfare of pest species (Eason et al 1998).

Concern about the welfare of animals during slaughter stimulated research into stunning and slaughter (Bager et al 1992). An area of contention was how to identify when consciousness was lost in an animal. Head-only electrical stunning of sheep caused insensibility for between 18 and 42 seconds (Blackmore and Newhook 1982), and in calves for 44 seconds (Gregory et al 1996). Head-to-back stunning of sheep and calves usually causes permanent insensibility (Blackmore and Newhook 1982). Electrical stunning, using electrodes on the neck and brisket, does not cause effective stunning (Cook et al. 1991). Red deer and fallow deer were rendered unconscious for 54 to 122 (Blackmore et al 1993) and approximately 60 seconds (Cook et al 1994). The duration of insensibility caused by electrical stunning should allow time for death by exsanguination before consciousness returns.

In the 1990's a series of trials to define and alleviate the pain and distress experienced by livestock following routine husbandry and veterinary procedures were carried out at Massey University. The distress caused by castration and/or tail docking of lambs, and its alleviation, was reviewed in a paper by Mellor and Stafford (2000). Tail docking causes much less pain than castration. Surgical methods of castration and/or tail docking caused the greatest cortisol response. The ring or the ring plus clamp techniques caused a lower response than surgery, but unlike its use in 1-week-old lambs, ring plus clamp castration of older lambs caused a cortisol response at least as great as that caused by rings. Giving local anaesthetic virtually abolished the cortisol response to ring castration but had little effect on the cortisol response to clamp castration, whereas administering a non-steroidal anti-inflammatory drug (NSAID) caused a significant reduction in the cortisol response to

the latter. The dehorning and castration of cattle causes an obvious escape behavioural response during the procedure, indicating severe pain, and a significant cortisol response thereafter. Research into the assessment and alleviation of this pain is discussed elsewhere in these proceedings (Stafford, 2008).

Transport of livestock is usually considered to be a significant welfare issue. Shipping sheep long distances, such as from New Zealand to the Middle East, has received attention both nationally and internationally. It is now effectively banned in New Zealand but in the late 1980's and early 1990's 100s of 1000s of sheep, usually ram lambs aged less than 1 year or 1-2 years, were shipped to the Middle East (Black 1989). Rams did poorly on sea voyages compared with wethers probably due to greater sexual activity (Black 1997). The animals usually adapted to shipping quite well but pneumonia, enteritis and inanition were the main causes of mortality aboard ship (Black 1989).

The transport of calves to slaughter and the effects of time spent in lairage (Stafford et al 2001a) are important welfare issues. Young healthy calves, 5 to 10 days of age, born full term and fed prior to collection were able to cope physiologically with being fasted for up to 30 hours which included up to 12 hours transportation (Todd et al 2000). Many calves did not receive colostrum from their dams (Vermunt et al 1995; Wesselink et al 1999) and, if transported, were more susceptible to welfare compromise (Stafford et al 2001a).

Mammalian pest control is an important activity in environmental conservation in New Zealand. All non-endemic mammalian species, both wild, and feral domestic species, are considered pests and controlled by a variety of methods including shooting, trapping, poisoning, or capture and removal. A few novel methods such as immunocontraception (Stafford et al 2001b) and biological control are also under investigation. Research into the welfare implications of trapping has concentrated on possums captured by holding or killing traps (Warburton and Orchard 1996). Warburton (1982) evaluated the humaneness and catch efficiency of 7 types of possum traps (5 kill and 2 leghold) and found a "failure of these traps either to catch efficiently or to do so humanely". More recently Nutman et al (1998) compared 3 types of traps used for possums and found that the "Timms trap" killed the animals more quickly than the other (LDL, Conibear 160) neck-hold traps. Bilateral carotid artery occlusion resulting in cerebral ischaemia occurred in 77% of possums caught in the Timms trap but only in 45% and 22% caught in the LDL and Conibear 160 traps, respectively (Nutman et al 1998). Injuries inflicted by different trap types have been used to compare the welfare implications of leghold traps and Warburton (1992) found that the No. 1 unpadded Soft Catch trap was best suited for harvesting possums in New Zealand as it was efficient and had a low injury score.

In New Zealand 6 toxins, namely 1080 (sodium monofluoroacetate), cyanide, cholecalciferol-Vitamin D, phosphorus, brodifacoum and pindone, are currently registered for possum control (Eason et al 2000). A number of other poisons are used to kill other pest species. The time to death in possums after ingestion of cyanide, 1080, and phosphorus was 14 minutes, 12 hours and 19 hours, respectively (Eason et al 1998). Animals poisoned by phosphorus showed the most pronounced and protracted sickness behaviour (Eason et al 1998). In a further study cyanide caused loss of consciousness after 6.5 minutes and cessation of breathing in 18 minutes (Gregory et al 1998). Both studies considered

cyanide to be a rapidly acting toxin with few undesirable side-effects. A serotonergic receptor antagonist having anti-emetic and anti-nausea effects, and a cholecystokinin receptor antagonist with anxiolytic effects reduced specific behaviours following 1080 administration in rats, suggesting that these behaviours may indicate some gastric upset or anxiety (Cook 1998).

Much research has also been carried out on other animal welfare topics including fish welfare (Lowe and Wells 1996), hyperthermia in dogs (Gregory and Constantine 1996), welfare of poultry (Gregory and Robins 1998, electroejaculation in rams (Stafford et al 1996), electroimmobilisation in deer (Stafford et al 1992), tail docking of calves (Petrie et al 1996), velvet harvesting in deer (Wilson 2002), body condition in deer (Wilson 2002), post-surgical analgesia in dogs (Fox et al 2000), cattle and deer handling and transport (Jacobson and Cook 1998), prevention of hypothermia in deer and lambs (Gregory et al 1999b; Pollard and Littlejohn, 1999); sow accommodation systems (Gregory and Devine 1999a), weaning stress (Cook 1999), and pain and fear physiology (Cook 1997).

Policy and legislation

In 1999 the New Zealand parliament passed a new animal welfare act which required animal owners to ensure that the physical, health and behavioural needs of animals are met in accordance with good practice and scientific knowledge (Mellor and Bayvel, 2008). The act has a number of codes of welfare which establish minimal standards and include recommendations for best practice. There are codes for dairy cattle, layer hens, broiler hens and pigs. A draft code of welfare for sheep and beef cattle is almost ready for gazetting. These codes are agreed upon by farmers, animal welfare and veterinary organisations and are subjected to public scrutiny. A failure to meet a minimum standard may be used to support a prosecution. Examples of minimum standards for beef cattle include “animals must not be deprived of feed or water for longer than 24 hours” “sheep and beef cattle being moved on foot must not be forced to proceed at a pace likely to cause exhaustion or heat stress”. In addition, cattle castrated after 6 months of age or dehorned after 9 months must be given pain relief. The codes are easier to change than an act would be and as there are codes for many species it means the act is a reasonably short document. Prosecutions are not uncommon and generally livestock farmers are prosecuted for allowing stock to die of starvation. The Ministry of Agriculture and Forestry have an enforcement division which undertakes investigations and prosecutions.

Conclusion

In New Zealand research into the welfare of livestock has a long and productive history. Legislation is based on scientific knowledge and best practice. The animal welfare legislation allows for incremental change in welfare standards by codes which are easily changed as knowledge grows or the environment changes.


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Notes

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The potential of harmonised welfare assessment as a management tool for veterinarians and their clients

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European consumers expect their animal related food products to be produced and processed with respect for the welfare of the animals. In response, the amount of EU legislation on animal welfare has increased steadily in recent years. This trend is likely to continue as the Treaty of Amsterdam has raised the ambitions of EU institutions to do more to raise welfare standards, and the EU Commission community action plan on the Protection and Welfare of Animals 2006-2010 outlines a range of co ordinated actions in this area (http://ec.europa.eu/food/animal/welfare/actionplan).

Recent crises such as BSE, swine fever, blue tongue, foot and mouth disease, and avian influenza have further increased awareness that animal production is more than just an industry. Europe's citizens no longer encourage more production of food to the exclusion of other priorities. Farming is seen as fundamental to other key goals such as food safety and quality, animal welfare, environmental protection, sustainability, and the upkeep of the countryside. Indeed, a growing concern for ethical and sustainable issues related to production processes can be identified as a major trend in European food consumer behaviour. There are differences in individual people's emphasis with regard to animal welfare, but in simple terms, good welfare is regarded by many as good physical and mental health. It is also generally agreed that welfare is multi-dimensional, depending on many aspects of life, including the extent to which an animal experiences both positive and negative states. Numerous trade groups, including producers, distributors, retailers and chain restaurants (Integrale Keten Beheersing in the Netherlands, Swedish Broiler Control, Filières Qualité Carrefour in France, McDonald's Europe and RSPCA Freedom Food in the UK) have created certification schemes that include elements of animal welfare. These schemes rely heavily on assessment of welfare by looking at provision of housing or resources, rather than looking at the animals themselves, and the emphasis in these schemes is on private, voluntary initiatives.

At present, there is no harmonised standard to assess animal welfare on farms within Europe bringing the required information to consumers. In the Eurobarometer survey, 54% of respondents said that they had difficulties in finding adequate information on the animal welfare standards applied in producing food. The focus of EU agricultural policy is increasingly on quality rather than quantity. Traditional price mechanisms do not always allow for important considerations like animal welfare to be properly recognised in the prices paid to producers, and if animal

welfare is to receive the priority demanded by citizens, new mechanisms need to be explored to address this deficiency. Provision of a guaranteed welfare level, whether voluntary or mandatory, may also have an important role to play. Consumers are increasingly insistent on higher standards and ways need to be found to provide them with information.
Farming bodies and legislators in the EU have recognised that improvements in farm animal health and welfare can be promoted by standardised assessment techniques and provision for animal health and welfare information to be made available.

Veterinarians in Europe play pivotal roles in relation to animal welfare issues. Vets who work in practice interact on a day to day basis with their farming clients, diagnosing and treating animal disease, and advising farmers on disease prevention and reduction, animal behaviour, welfare issues, breeding and nutrition. Some vets are responsible for both animal and public health considerations at slaughterhouses, and help to ensure that animals are treated well at the time of slaughter. Others carry out surveillance for both animal and zoonotic disease in farm and companion animals, during transport and at international borders. Vets are involved in research into animal (and human) disease, and are also prominent in discussions on animal welfare, trade in animal products, and conservation and sustainability issues. Vets traditionally have a focus on disease treatment and prevention. However, many veterinary training programmes are recognising that ethology, ethics and welfare are also important parts of a veterinary role. As well as assessment of health and welfare, vets can help farmers implement strategies to improve welfare through the quality of stockmanship, understanding of animal behaviour and support for improvements in animal welfare through housing and husbandry, and genetic selection.

Despite a large amount of co-operation between veterinary organisations and government agencies with respect to disease control, there is comparatively little ‘benchmarking’ information shared between countries when it comes to animal welfare parameters. How might information about animal welfare parameters be useful to vets and to their farming clients?

Let us consider an example. A dairy farmer has a problem with lameness in his dairy cows. A structured assessment will help him to identify practical ways of trying to reduce lameness. For example, information on the type of floor and the farmer’s hoof care strategy could be used to help advise on remedial solutions. In the case of cattle lameness, the problem can be both an economic cost (lameness in dairy cows costs the farmer in terms of lost productivity) and also a cost to the animals in terms of disability or discomfort. Targeted improvement may be able to help both the farmer and the animal. To be viable, remedial strategies must satisfy both welfare and economic requirements, and they must be practicable, ie. Affordable and easy to implement by the farmer and/or breeding company.


Practical solutions do not necessarily imply the exclusive adoption of free range systems or of extensive, organic farming. Intensive forms of livestock farming may also safeguard the animals' welfare, providing that they meet the animals' needs. When this information is linked to economic information that the farmer is likely to share with his vet, then the vet has a powerful tool to help and support his farming clients and to promote best management in animal health and welfare. This productive relationship between the vet and the farmer relies on several things – trust, information and economic sense. Trust comes from the professional interaction between vet and client; information is part of the armoury of skills that makes the vet a valuable part of the farming system, knowledge of what is common and uncommon, what disease looks like, the specialist techniques of surgery and medicine, and knowledge of how his clients farm, and how economic, disease and welfare performance relates to other similar farms. The feedback of information to the farmer, often with veterinary involvement, and his/her uptake of recommendations and remedial measures represent the most direct advantages of this approach. Furthermore, the development of such an integrated, standardised assessment procedure will provide an invaluable tool for testing and evaluating new housing and husbandry systems, as well as new animal genotypes, before they are allowed onto the market.

In all EU countries, the State, usually through a State veterinary service, carries out some visits to farms to ensure that they can deliver compliance with animal care and welfare legislation. It is possible that demonstration of adequate (or even high) welfare standards would allow targeted farm inspection, and the State inspection load could be optimised using information provided by inspection schemes, which include a harmonised welfare assessment. The potential for the streamlining of animal health visits could be a genuine benefit to farmers and to the State.

Most previous work on monitoring systems has focused on 'what' or 'how much' of different resources are given to animals, and this resource-based approach is the basis of existing legislation.

WelfareQuality®, (http://www.welfarequality.net) is a large integrated project with the aim of providing relevant and understandable information on animal welfare.

WelfareQuality®, through collaboration with 39 institutes across Europe and 4 participating groups in Latin America, has been developing on-farm and slaughter assessment systems to address the key areas of feeding, housing, health and disease, and behaviour.

- Are the animals properly fed and supplied with water?
- Are the animals properly housed?
- Are the animals healthy?
- Can the animals express a range of behaviours and emotional states?

The combination of traditional resource-based information linked to animal-based measures has the potential to provide a very powerful tool for informing the farmer of the welfare status of his animals, enabling him to see how he compares to other farms, and also supporting improvements and management decisions. The information that results from the assessment of these measures can then be provided at several levels. The farmer can receive a result for each single assessment measure, for example, how many thin cows he has (and so he can compare this information with other farmers, and also use

it to plan and make management decisions). The farmer can also receive summary information at the level of thermal comfort, ease of movement, etc., and also at the level of principles (housing, health, feeding, behaviour). Finally, a combined score could be used to inform both the producer and the purchaser of the overall welfare outcome.

The ways in which information from assessment can feed back:

- Information at the level of measures and criteria can be provided as veterinary advice and support for the farmer;

- Information may be supplied to the consumer at the level of information on principles (feeding, housing, health and behaviour), or as an overall assessment result.

The spread of opinion amongst farmers can be summarised as being characterised by belief, hope and doubt. Farmers participating in 'top quality' assurance schemes are motivated by access to improved prices and some state that they have improved 'pleasure in their work' when they supply to improved standards. For all farmers, security in their market is an important driving factor. Some farmers do not participate in specific animal welfare schemes because they have no faith in the financial benefits promised, and see only an increase in bureaucracy and work load, and fear a loss of their independence. Many farmers hope that animal-friendly products will offer opportunities for new markets, but they also feel threatened by the potential import of cheaper meat from third countries and the resulting competition on price. More 'conventional' farmers can see room for improvement and accept the need to respond to animal welfare concerns, but have considerable doubts about the economic benefits.

Veterinarians who work with farmers in all of these classes have a role to play in using their specialised knowledge to help ensure that high levels of animal welfare go hand-in-hand with support for successful farming business. In summary, veterinarians who work directly with their farm clients, those involved in assurance schemes, those carrying out disease surveillance, and import and export work may find that a series of harmonised welfare assessment tools are of real value to their business. These tools may be of use for a number of purposes:

- To allow inspection and scoring of farms, to inform consumers about the welfare status of the animals from which they buy products, and to provide advice and support for the farmer based on the data collected on the farm. Additionally, technical specifications may be used by veterinary inspection agencies in their statutory assessment of farms.

- The technical documents will contain scoring and assessment systems and 'reference' values that may prove to be of real ongoing value to farmers and to their vet, so that a farmer can really assess how his management and stockmanship decisions lead to measurable change in his animals' welfare.

Notes

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Xavier Manteca Vilanova received his BVSc degree from the Autonomous University of Barcelona and a Master's degree in Applied Animal Behaviour and Animal Welfare from the University of Edinburgh. He has a PhD from the Autonomous University of Barcelona. Currently, he is associate professor at the Department of Animal Science, School of Veterinary Science in Barcelona, where he teaches animal behaviour and animal welfare. His main research interests are in the field of farm animal behaviour and welfare.
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Integrated, knowledge-based practical strategies to improve on-farm Animal Well-being

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Concern about the welfare of farm animals has increased in many countries over the last decades and animal welfare is fast becoming a global issue. Animal welfare can be defined in a number of different ways and these can be grouped into three main approaches: a "feeling-based" approach, a "functioning-based" approach and a third set of approaches in which welfare is measured by assessing whether the animal can live according to its inherent "nature". The different approaches are by no means contradictory and there are many cases in which they lead to similar conclusions. For example, it has been shown that when animals are prevented from performing certain behaviours they mount a stress response which, if intense or long-lasting, could have deleterious effects on the functioning of the animal.

Despite the use of sophisticated feeding and management regimes many farm animals still suffer from a range of behavioural or health problems, which may seriously compromise their welfare and require frequent use of medication. The usual approach to these problems focuses on modifying the housing system in an attempt to accommodate behavioural and other needs and to provide those environmental conditions that allow farm animals to successfully adapt to challenging stimulation without suffering harmful consequences. However, although this is a highly appropriate and socially accepted strategy for improving farm animal welfare, it may not be sufficient for maintaining good welfare in the long run. This might be due to the fact that housing is only a part of the environment in which farm animals are kept, stockmanship being at least equally important. Also, if poor welfare can be understood as the result of a mismatch between the environment and the needs of the animals, it could be argued that selecting animals that are better able to cope with a particular environment may be an alternative strategy to improve welfare.

Most of our farm animals are still easily frightened when they encounter human beings, particularly if their appearance is sudden, unusual or threatening or unusual. Such fear of humans is a major welfare problem that also has marked negative consequences on health, production, product quality and profitability. Research carried out over the last two decades has shown that there is a large variability between farms in the animals' fear of humans and that fear of humans is largely determined by the behavior of the stockpersons towards

the animals, especially during sensitive periods, (though the animals' background genomes can also be an influential factor). In turn, the behaviour of stockpersons is known to reflect their beliefs, attitudes and skills. Therefore, training programmes aimed at improving stockmanship can have a very positive impact on the welfare of animals. Moreover, inappropriate handling during loading and unloading may cause distress and may have an adverse effect on meat quality.

For example, work done in Australia has shown that stockpersons' attitude is a major factor explaining day-to-day human-animal interactions (especially the number of interactions of a negative nature) and their consequences on welfare and production. Personality traits, self esteem and job satisfaction have been shown to be important factors. Stockmanship is also very important in European systems and EU directive 95/58/EC states that "animals shall be cared for by a sufficient number of staff who possess the appropriate ability, knowledge, and professional competence". Despite this, problems related to poor stockmanship are still fairly common in Europe. In France for example, 33% of farmers' injuries occurred during contact with animals, indicating that human-animal interactions are often difficult. Fear of human beings also accounts for a substantial proportion of the variation in egg production and growth in laying hens and broiler chickens, respectively and farms recording good food conversion were those at which the broilers were least frightened of humans. Some of the reasons for the appearance of such problems may be inappropriate behaviour by the stockperson and the lack of adequate training programmes. Although effective training programmes have been developed elsewhere, particularly Australia, they have not been widely used in Europe, mainly because to be fully effective such programmes must be tailored to the specific production system and the characteristics of the producers in each country.

Genetic selection is becoming an increasingly important tool for improving farm animal welfare. It can be applied with two different aims: firstly to prevent the negative consequences that selection for certain production traits may have on animal welfare (such as increased prevalence of lameness in broilers due to selection for rapid growth) and secondly to select animals that are better able to cope with existing production systems and perhaps future developments. Examples of the latter include selection for reduced aggressiveness in pigs and for greater sociability in dairy cows.

Production systems are generally designed and implemented to fit the needs of the average animal rather than the individual. Given the profound individual differences in many important biological characteristics within the same farm animal species or breed, a production system that is favourable for one individual may be less favourable or even detrimental for another. Extensive work in rodents, poultry and primates, including humans, suggests that adaptability to environmental change - in terms of the propensity to develop disease or stress-


related pathologies - is mediated by a number of underlying psychobiological characteristics that are to a certain extent (epi)genetically controlled. These characteristics include: (i) fearfulness (also sometimes labelled temperament or emotionality) which is defined as the propensity to be easily frightened in novel or unpredictable situations, (ii) sociality, i.e. the motivation to be with companions and the ability to adapt to the social environment, and (iii) activity or coping style, the qualitative type or strategy of response (e.g., active or passive) the individual adopts when challenged. Research in molecular and behavioural genetics is unravelling the genomic basis of these traits. So far, results support the notion that responsiveness to environmental challenge across species may involve common biological (e.g. neural) substrates, probably determined by homologous genes. Studies in bovines, sheep and pigs also imply the existence of similar characteristics and, encouragingly, reveal associations between individual differences in stress responsiveness and contrasting immunological responses, disease incidence and production efficiency. Thus, identifying and utilizing fundamental psychobiological traits underlying adaptation to the physical and social environment might represent an effective strategy for improving farm animal welfare in a broad sense.

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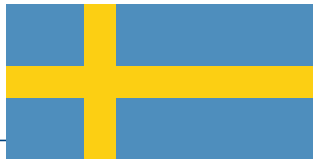
National project leader for the Dairy Cattle Health programme in Sweden - FRISKKO, Swedish Dairy Association 1994-2000,

National project leader for the development of a Swedish Animal Welfare Monitoring in Dairy production, Swedish Dairy Association.



An assessment of the economic value of good welfare in Swedish dairy herds

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The positive association between good animal welfare and sound economy is considered to be a strong motivating factor for farmers to work constructively with improving welfare. The aim of this study was to investigate associations between production economy and potential indicators of animal welfare. Annual accounting data from 160 Swedish dairy farms for the years 2002-2004 were studied. The economic outcomes investigated were the contribution margin per cow and year, and underlying cost/income items, such as income from milk and from other sources (including slaughter) as well as costs related to feed, labour, veterinary care, advisory services and artificial insemination. Sixty-six potential welfare indicators from pre-collected register data, representing the life span of a dairy cow, were identified and expressed as annual herd-level incidence rates, -risks and prevalences. Multivariable regression was used to investigate and quantify effects on the economic outcomes.

Welfare indicators were ranked based on their indirect influence on the profit margin, through the individual cost/income items. The parameters with the highest rank were bulk milk somatic cell count, incidence risk of stillbirths, incidence of veterinary treated claw and leg diseases, young stock mortality, proportion of cows with no veterinary treatment, prevalence of cows with low urea levels, followed by probability of survival in early lactation, culling rate, dystocia and risk of late initiation of AI (>70 days). All parameters, except stillbirths, had a favourable association (from a welfare perspective) with economy. Breed significantly influenced a large number of welfare indicators, particularly within the areas of fertility, udder health and calf and cow survival, all in favour of the Swedish Red and White compared to the Swedish Holstein breed.

Notes

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