

Poster Abstracts

The welfare of captive starlings

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The European starling *Sturnus vulgaris* is one of the most widely used birds in the study of animal behaviour and yet very little is known about its welfare. The topic of laboratory bird welfare has recently been brought to the forefront because the EU is reviewing laws regarding their husbandry and care. We feel it is vital that these laws be based on good science. To find out more about starling welfare, we conducted a classic two-by-two design, manipulating cage size and enrichment to give four possible treatment groups: small barren, large barren, small enriched and large enriched. The smaller cage size (H52 W85 D51cm) reflected those currently used at our facility, the larger (H85 W141 D84 cm) those suggested by the new draft regulations, whereas enrichment reflected the specific needs of the species (natural branches, foraging substrate and water baths). Sixteen starlings were each left in one of the four cage types for one week, and various physiological and behavioural methods were used to measure their welfare, including analysis of corticosterone, fat, foot and feather condition scores, general differences in behaviour and behavioural time budgets, in addition to scores of diversity and repetitiveness of behaviour exhibited. Small barren cages indicated the worst results in nearly all measures of welfare used: the birds spent more time sedentary in small (ANOVA: $F_{1,12} = 8.00$, $P = 0.015$) and barren cages (ANOVA: $F_{1,12} = 7.08$, $P = 0.021$), performed more behaviours specific to caged environments in small (ANOVA: $F_{1,12} = 8.79$, $P = 0.012$) and barren cages (ANOVA: $F_{1,12} = 7.93$, $P = 0.016$) and performed more repetitive sequences of behaviour. Although starlings in large enriched cages had the best measures of welfare, this was closely followed by the large barren and small enriched cages, which were approximately equivalent. Our results suggest a loss in cage space can be compensated for using appropriate enrichment.

Ethical aspects of animal-assisted psychodynamic therapy

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In Animal-Assisted Psychodynamic Therapy the therapist is responsible for the well-being of two entities: the patient and the animal. Whereas it is common to assume that a therapist is responsible for his/her patient, ensuring the animal's well-being in therapy is at least problematic. Therefore this three-dimensional psychodynamic therapy situation seems to

present an inherent serious ethical dilemma to the therapist. In such therapy, the animal serves as intermediary between the patient's external and inner realities. The patient relates to his/her inner contents through projection and transference onto the animal. The form of playing and the nature of relating and interacting with the animal reflect the patient's inner world. The therapist's role is to identify the major conflicts with which the patient is coping, as working material. Since the patient's inner contents concern painful and frustrating experiences, he/she may transfer/project those very experiences onto the animal. The therapist's responses to such acts may vary from setting limits to alerting the patient's consciousness. Thus, the patient will stop his/her act but will also be hindered from expressing and later coping with his/her major conflicts. Consequently, the therapist will not be ensuring the patient's well-being and will inevitably find him/herself confronting ethical issues, concerning his/her obligation to ensure the animal's welfare. Five aspects of the animal's welfare cannot be totally secured: freedom of movement; protection; closeness and touch; social connection; and preventing instrumentalisation (reification, de-animalisation).

Anticipatory behaviour — a means of determining the significance of positive and negative events?

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One of the challenges facing animal caretakers is determining how much an animal likes a positive event, or dislikes a negative event, especially when there are alternatives available. For example, it is important to assess the value of environmental enrichment to ensure that it is appropriate and enjoyable, or to determine which method of restraint for a blood draw is least stressful. It is well known that animals use signals to predict events, but their anticipatory behaviour between the signal and the occurrence of the forthcoming event has not been investigated in detail to determine how useful it is as an indicator of their feelings towards the event. This study examined the use of anticipatory behaviour as a tool to assess the rewarding properties of a positive event in laboratory-housed common marmosets (*Callithrix jacchus*). We studied six pairs in each of four conditions (positive, neutral, negative, and sign only). Following data collection in the Baseline stage, a Pavlovian conditioning schedule was applied to announce an oncoming stimulus and behavioural data collected in this Anticipation stage. The positive unconditioned stimulus was marshmallow, a favoured food treat; the neutral stimulus was commercial monkey chow, and the negative

stimulus was a two-second puff of air from a hair-dryer. The difference between Anticipation and Baseline behaviours were calculated for each pair. The results indicate that the monkeys performed different anticipatory behaviours prior to the conditioned positive stimulus. These findings suggest that anticipatory behaviour is a useful method for assessing the value of positive events.

Quality of life and the rodent laboratory

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Two elements central to quality of life (QoL) are (1) having opportunities to perform highly motivated behaviours, and (2) the ability to escape stressful stimuli. Published studies were reviewed to assess the effects of standard laboratory housing conditions on the behaviour of rodents, particularly mice and rats. Preference studies show that 'lab' mice and rats value opportunities to take cover, build nests, explore, forage, and gain social contact, behavioural needs that are by and large thwarted by standard laboratory housing systems. Eighty additional studies were reviewed to assess the potential stress associated with three routine laboratory procedures: handling, blood collection, and gavage (force-feeding). Pronounced and significant changes in stress indicators (eg concentrations of corticosterone, heart rate, blood pressure) occurred for all three procedures, indicating fear, stress, and/or distress. These literature reviews depict a poor QoL where chronic lack of stimulation is exacerbated by regular stressful episodes. As Jeremy Bentham first elucidated, sentience, and not species membership *per se*, informs ethics. Research and common sense tell us that rats and mice experience both positive and negative affective states. Consistent ethics demand a dramatic revision of our treatment of rodents in labs.

Multicriteria assessment of the quality of farm animals' life

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The European project Welfare Quality aims to produce a standard for the evaluation of the welfare of farmed cattle, pigs and poultry to be used in certification schemes. Because welfare is multidimensional, and refers to quality of life perceived by the individual, this evaluation will rest on various measures that are essentially animal-based. A reasoned approach, using methods developed in MultiCriteria Decision making, will be followed to aggregate the measures into an overall assessment. At the outset of the project, four welfare criteria were outlined as being applicable to any species: good feeding, good housing, good health, and appropriate behaviour. Each criterion was further refined into 2 to 4 subcriteria giving a total number of 12 subcriteria. The subcriteria were constructed using several mathematical methods chosen according to the number of measures contained in each subcriterion, their nature and the precision with which it is assumed they can be taken. The appropriate subcriteria were combined to evaluate each criterion, and compensations were limited by attributing more importance to the lowest subcriterion-scores, thus encouraging producers to correct the more severe problems first. The aggregation of criteria, to create an overall assessment, will aim to limit further compensations because one welfare criterion should probably not compensate for another. This progressive construction of an overall welfare assessment for farmed animals may help in the design of similar tools for other animal use situations – such as in companion animals, for labelling pet breeding units, kennels or shops.

The present study is part of the Welfare Quality research project which has been co-financed by the European Commission, within the 6th Framework Programme, contract No. FOOD-CT-2004-506508. The text represents the authors' views and does not necessarily represent a position of the Commission who will not be liable for the use made of such information.

Compliance with physiology as the foundation for animal welfare guidelines: exemplified by the physiological rehabilitation of the horse's foot and mouth

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Cruelty is defined as the infliction of avoidable suffering. Recent advances reveal that horseshoes and bits deny four of the five freedoms and are, by definition, cruel. Simple, physiologically compliant and realistic management changes permit removal of these metal impediments, enhancing welfare, improving performance, preventing disease, and reducing accidents. Horseshoeing and housing that restricts movement cripples horses. Lameness is regrettable enough but navicular syndrome and laminitis are diseases often

terminated by euthanasia or death. Removal of the cause being a prerequisite of treatment, this requires: (1) cessation of shoeing; and (2) management that complies with physiology (eg adequate movement, hoof hydration, and judicious trimming to return a deformed hoof to its correct anatomical shape). When years of shoeing have deformed the hoof, rehabilitation may sometimes cause temporary discomfort. A decision over whether barefoot management or euthanasia is appropriate requires answers to two questions. First, based on the clinical evidence, does the shod horse have a fighting chance of recovering? Second, can the professional caretaker and owner provide the necessary knowledge, commitment and resources? When transition to barefoot management results in abscess formation during the necessary remodeling it is unavoidable. Being unavoidable, it is not cruel. The recently developed crossover bitless bridle provides uniquely painless communication that is safer and more humane than the bit. Currently, FEI rules mandate use of the painful bit for most disciplines. Often, the rules require two bits and a chain. Amendments are required so that these international rules comply with welfare guidelines and permit painless communication.

Effective veterinary response to animal abuse

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Animal abuse is an important social issue affecting animals, families and communities. Both to protect an animal victim and because the abuse may be a sentinel for other violence that is occurring within or outside the family, it is crucial that veterinarians deal effectively with instances of suspected animal maltreatment. Veterinarians are well-trained in proper animal husbandry, and well-equipped to recognise substandard care, yet many veterinarians are reluctant to intervene when they suspect abuse. The first step is to be alert to the possibility of abuse. Animal abuse includes physical (non-accidental injury), sexual or emotional abuse, neglect, and staged animal fights, with the majority of abuse arising from neglect. Generally, suspicions are raised by a combination of factors, such as features in the history; the behaviour of the client, family members or the animal; and certain types of injuries. No single feature is diagnostic of abuse. Many cases, particularly of neglect, can be handled through client education. In deciding whether to educate or report, consider elements like the number, duration, and severity of problems, and previous medical records on this or the client's other animal(s). Where there is evident abuse or ongoing neglect, report this to the appropriate authority. Appropriate and thorough documentation is essential. The information you provide will be crucial for the inspector, and you may be required to give evidence in court eventually. Equally important to an effective response is being

prepared in advance. Know the relevant legislation and to whom suspected abuse should be reported. Discuss the issue in your practice and establish a clinic policy, including a follow-up strategy for borderline cases and important telephone numbers (animal protection, social services for concerns about potential child abuse). Comprehensive information to assist veterinarians facing suspected abuse can be found on the CVMA website at <http://canadianveterinarians.net/animal.aspx>. Launched in July 2006, the site has six sections: The Link — animal abuse, child abuse and domestic violence; Recognising abuse; Reporting abuse; Collecting and documenting evidence; Veterinarians as expert witnesses; and Building a safe and humane community. The veterinary profession can benefit greatly from the experience of those in family protection services. The response to child maltreatment was significantly enhanced with the advent of child abuse/neglect definitions, diagnostic guidelines, mandated reporting, and provision of immunity to those reporting abuse. The CVMA position statement on animal abuse advocates mandatory reporting of abuse and provision of immunity for good faith reporting; and the CVMA continues to lobby for improved federal legislation to address animal cruelty.

A trap, neuter and release programme in Prince Edward Island, Canada — a humane approach to feral cat management

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Most communities have populations of feral cats that are of concern to community members, veterinarians, and animal control agencies. These semi-wild cats — offspring of stray or abandoned animals — typically live in areas where they are able to find food and shelter. They generally have a reduced lifespan due to illness and injury, often related to uncontrolled reproduction. Community members may feed, ignore, malign, or abuse these cats, and animal control agencies have traditionally dealt with them through trap and euthanase programmes. Trap, neuter and release (TNR) programmes represent an alternative approach to feral cat management. Prince Edward Island (PEI), Canada, has had such a programme in place since 2001, through which the cats are anaesthetised; tested for Feline Leukemia Virus (FeLV) and Feline Immunodeficiency Virus (FIV) and euthanased if positive; vaccinated against feline viral rhinotracheitis, feline calici virus, feline panleukopenia virus and rabies virus; neutered; dewormed; tattooed (ear); and, after recovery, released back to the original area. The cats also receive minor medical care, such as treatment of wounds and ear cleaning. In early 2001, testing showed the

prevalence of FeLV was 8.2%, and of FIV, 10.8%. These values have declined to 4.4% and 4.0%, respectively, at the end of 2005. There are three crucial components to the success of the PEI programme. The first is community support and involvement. The project is overseen by the PEI Cat Action Team (CAT), which provides advice to caretakers of individual colonies, and coordinates trapping and release of the cats. Veterinarians provide medical services and advice, and funding partners provide the necessary financial support. The majority of the cats are neutered at the Atlantic Veterinary College by clinicians and veterinary students, with funding through the Sir James Dunn Animal Welfare Centre and the Pegasus Family Foundation through the Peninsula Community Foundation. Additional feral cats are neutered at participating Island veterinary clinics with funds privately raised by CAT. Pfizer Animal Health donates vaccines and medications, including selamectin and analgesics, which all cats receive. As of June 2006, 2514 feral cats have passed through this programme, which benefits individual cats by decreasing fighting activity and preventing the spread of disease, with the long-term goal of achieving negative population growth. One rough measure of population trends in the PEI feral cat population is the number surrendered annually to the PEI Humane Society, and this is being monitored.

Animals and us: an educational model improving quality of life for animals

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Surveys have shown that amongst the Arab population living in Israel, many of whom live in urban areas, the culture of keeping animals as pets is not well established. Children may have little or no contact with animals, except with those kept for their meat or milk, or that are used as pack animals. Over a period of three years, with the aid of schoolchildren aged 12–13 years in Jaffa, we piloted an educational model aimed at creating a more positive attitude towards animals amongst such children. The model, developed in the Zoological Gardens of the Zoology Department of Tel Aviv University, comprises a classroom framework, study tours and uniquely designed arts and crafts activities. Evaluation is carried out through before-and-after questionnaires. The program is constructed to run for one academic year, and can be adjusted to younger or older age groups. The program resulted in a significant improvement in the children's attitude to animals, reflected in objection to cruelty and a more positive approach to dogs, which are often viewed as 'unclean' animals in the Islamic world. Our findings also indicate that the developed model would be equally applicable to any community in which a more positive attitude towards animals would benefit both the animal and the human population.

Assessment of pain and welfare in sheep

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Animal welfare is the combination of subjective and objective (qualitative and quantitative) aspects of the conditions of life for animals, including health and disease, behaviour, husbandry and management, and is thus a complex and abstract construct. Applied to sheep, it must encompass that of flocks kept in a wide variety of environments and the welfare of individual sheep within these flocks must also be taken into account, presenting considerable logistical challenges for assessment in either intensive or extensive systems. Good sheep welfare can be compromised by many factors including disease and husbandry and many welfare assessments have involved the study of behaviours and biochemical changes, such as plasma cortisol and acute phase proteins. Scientists in the welfare field are increasingly adopting an approach modelled on that taken in human medicine to measure quality of life which as related to welfare is made up of a number of different dimensions: physical, social, and psychological. We have recently applied this approach combining both quantitative and qualitative methods, to provide a welfare and pain assessment tool in sheep for use on farms. Disease prevalence and severity assessments were combined with qualitative indicators of welfare to produce a tool ready for trial on farms. Preliminary tests of inter-observer reliability indicated that agreement between observers varied depending on the item under study (body condition score *versus* lameness score). Further work will embrace studies on intra-observer variability and the utility of the sensitivity to detect change.

Dissolving the explanatory gap: do fish feel pain?

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Are fish (or any other animal) able to experience pain? It seems this question cannot be answered if we adopt the view that a scientific description of a cognitive system cannot account for the relation between the described physical process and the qualities of experiences. My thesis is that the reason for this lack of understanding is *not* that qualities fall beyond the scope of the scientific method, but that we adopted certain presuppositions concerning science and experience. First, the presupposition that science should be characterised by an particular ontology (ie materialism) and, second, the conviction that the existence of qualities cannot be denied. Taken together, these intuitions create the

problem of how the qualities of experiences are related to the results of the natural sciences. However, there is an alternative framework available (based on the writings of John Dewey) that could, once again, connect the sciences to the qualities of experiences. From this pragmatic perspective, experiences are no longer considered as internal phenomena, but should be equated with meaningful situations. Therefore, qualities are qualities of meaningful situations. The sciences are able to transform indeterminate situations into more determinate ones, thereby adding meaning (and the possibility of control) to the qualities of these situations. As a result, the sciences do not reduce or replace our experiences but explain them further by using more elaborate instrumentalities to extend our control over the qualities of experiences. This approach could shed some light on the question of whether fish are capable of feeling pain.

Discrimination of new commands by the dog

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Dogs are widely believed to be very good at recognising human speech, but there is actually very little direct experimental evidence to support this conjecture. Failure to obey can result in the use of punishment and pose a serious threat to the welfare of the pet dog, since it is often the pet that is blamed for being disobedient in this circumstance. Dogs have been shown to be able to discriminate changes to command phonemes in both Japanese (Fukuzawa *et al* 2000, 2001) and English commands (Fukuzawa *et al* 2005) respectively when the dog was normally trained in these languages, but it is unclear whether this discrimination arises out of familiarity with the native language. Therefore the objective of this study was to investigate the effect of changes in verbal command phonemes on auditory discrimination in dogs, when the dogs were trained in a different language to their normal training. Twelve dogs (aged 12 months to 120 months old; four male, eight female; seven pure-breeds) were trained individually by the same female trainer in two parts to two commands (“sit” and “come”), controlling for trainer body posture, eye contact and the emotional content of commands. Performance in response to each command was rated by the trainer using the scoring system developed previously by Fukuzawa (Fukuzawa *et al* 2000, 2002). The experimental three phonetically altered commands were as follows: “SIT”; CHit [tʃit], sAt [sæt], and siK [sik], “COME”; Tome [tʌm], cEme [ki:m], or coFe [kʌf]. The difference between the recognition scores for each unaltered command before and after the experimentally altered command *versus* the altered command was assessed with a paired *t*-test. The results suggest that the dogs noticed changes to phonemes in English commands, even though the dog had only brief exposure to the language.

The effects of the presence of an observer, and time of day, on welfare indicators for working police dogs

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Behaviour plays a major role in the assessment of quality of life, but is likely to be altered if the subject is aware of the presence of a human observer. This may apply especially to kennelled working dogs, many of which actively seek human companionship. Within the kennelled environment, husbandry usually occurs at specific times, so it is likely that the behaviour of the dogs will also change depending upon the time of observation. Two populations of working police dogs were studied at 16 sites. Population 1 (WPD1, *n* = 47) were worked during day and night; population 2 (WPD2, *n* = 45) were worked only at night. Behaviour was recorded by a visible observer for 2 min (morning), and by remote video for two 5 min periods when no staff were present (midday and evening). Presence of the observer, and time of day, both affected behaviour. For example, in both populations proportion of time standing was greater with an observer present (Wilcoxon tests: WPD1, *z* = -4.6, *P* < 0.001; WPD2, *z* = -4.4, *P* < 0.001) than at midday, and duration of sitting was greater at midday than in the evening (WPD1, *z* = -3.0, *P* < 0.002; WPD2, *z* = -2.3, *P* < 0.02). However, many other effects of observer and time of day were significant in one but not both populations, probably reflecting differences in diurnal patterns of working and human contact. Therefore when assessing the welfare of kennelled dogs, behaviour should be recorded in both the presence and the absence of an observer, and taking the working pattern of the animal into account.

Farm animal cloning and ethics — revisiting the animal welfare debate

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The notion of animal welfare and of how to define it has been widely discussed within the literature. However, an integrative model, regarded to mirror the scope of animal welfare science and the ethical aspects of human treatment of animals directly related to the animals, has won some popularity the last 10–15 years. Thus the subjective experience of the animal, the health or fitness of the animal and

the behaviour are seen as the areas that cover the ethical questions related to animal welfare. This way of defining the ethically relevant concerns does, however, leave out central ethical notions relevant to the evaluation of various biotechnological tools used on animals. In this article we will look more closely at these ethical notions under the heading of animal integrity and discuss to what extent these notions are connected to the area of animal welfare. This will be done using farm animal cloning as an example. Although this technology can be seen as not necessarily compromising the animals from the perspective of an integrative welfare definition, this does not seem to end the ethical debate about cloning. The central claim will be that although the concept of animal integrity does not readily fit into an integrative definition of animal welfare, it is, however, a relevant issue in this context and should not be forgotten as a central aspect of the overall evaluation of the impact of the technology on animals.

Predictability and expectations influence emotional responses in lambs

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The quality of life of an animal refers to its representation of the environment, notably its emotions. According to appraisal theories, emotions result from an evaluation of an event by the individual using few elementary criteria (eg novelty and unpredictability produce surprise). Previous studies in lambs have shown that the suddenness and the unfamiliarity of an event induce distinct emotional responses. We investigate here whether lambs are also sensitive to the unpredictability of an event and to the discrepancy from their expectations. In Experiment 1, 36 lambs were trained to receive 10 food distributions in one session. A sudden event followed five distributions either chosen at random, or after each other distribution, or associated with a light signal. Fear responses to suddenness (startle and tachycardia) were less pronounced after the light signal. In Experiment 2, 44 lambs were trained to perform a task to obtain a food reward. Then, half of the lambs of each treatment were shifted to a larger or a smaller reward before returning to their initial reward (successive positive or negative contrasts). The remaining lambs were later subjected to a suppression of the reward. Negative contrasts induced signs of frustration (increased attempts to obtain the reward), ears movements and tachycardia which were more marked, in the case of a suppression, when lambs had received a large reward before. The predictability of a situation and its conformity with expectations affect emotional responses of sheep. Basic mechanisms underlying emotions like fear or frustration seem thus similar between humans and sheep.

The hearing dog partnership: ensuring quality of life for both dog and client

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Recent research by the author highlighted the benefits of the placement of trained hearing dogs with deaf or hard-of-hearing people. Participants took part in a longitudinal study to monitor the dogs' working performance and examine the social and psychological effects of having a hearing dog. The Profile of Mood State (POMS) questionnaire and the General Health Questionnaire (GHQ) were used together with a Hearing Dog Questionnaire (HDQ) specifically developed for this study. There were a number of significant differences in measures of well-being between time periods before and after the placement of the hearing dog, and no comparable differences during the year-long waiting period. Participants reported significant reductions in hearing-related problems, significant reductions in measures of tension, anxiety and depression, and significant improvements in social involvement and independence. However, it is essential in a working partnership that the needs of the assistance dog are not overlooked. Therefore, the Charity constantly strives to promote the highest standards of welfare and training, not only of hearing dogs but also assistance dogs worldwide, and to this end played a key role in producing the standards and ethics for the newly formed Assistance Dogs Europe, AD(Eu), to ensure the welfare and quality of life of all assistance dogs. In addition to current ways of monitoring welfare the Charity has undertaken the measurement of cortisol levels during training to highlight any potentially stressed individuals. These measures help to ensure good quality of life for both dog and client and a truly symbiotic relationship results.

Feeding with welfare in mind: the role of alternative forages in meeting energy demands of domesticated horses

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Increased energy demands placed upon domesticated horses dictate that traditional forage-based diets of hay are replaced by high-energy, cereal-based alternatives. These regimes, while providing the required energy, do not allow the horse to indulge in innate grazing behaviours, thus increasing the likelihood of developing oral stereotypies through reduced intake times. Furthermore chronic and acute metabolic disorders such as acidosis, colic and laminitis are linked to feeding starch-rich high cereal diets and these conditions seriously compromise the welfare of

the horse. This study aimed to identify high nutritive forages that can meet energy requirements while satisfying the horse's innate eating behaviour. Six ponies were *ad libitum* fed Hay (H), big bale grass silage (GS) and big bale red clover silage (RCS) in two simultaneous 3 x 3 Latin square digestibility trials. Apparent digestibility of energy (DE), fresh weight intake (FWI) and dry matter intake (DMI) was determined by total faecal collection. FWI for RCS were significantly higher (FWI values [kg/d] H, 6.40; GS, 15.96; RCS, 26.24; s.e.d. 1.46; $P < 0.001$) than for GS and H. DMI was highest for RCS (DMI values [kg/d] H, 5.5; GS, 6.13; RCS, 7.2; s.e.d. 0.44; $P < 0.05$) but was not significantly different from GS. RCS and GS showed significantly higher DE values than H (mean DE values [MJ/kg/d] H, 6.023; GS, 14.567; RCS, 14.263; s.e.d. 0.40; $P < 0.05$). The high DE values for both RCS and GS indicate that these forages could meet the recommended daily energy demands for horses in hard work and therefore could be fed in place of conventional cereal-based feeds, providing a more natural alternative to energy provision.

A comparison of people's attitudes to dogs on the Faroe Islands and in England and how that affects canine welfare

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Research has been carried out on attachment and attitudes to dogs in several countries, both looking into psychological benefits to humans and dogs of the attachment between them and commitment to pets and how that can be influenced. No such research has been carried out on the Faroe Islands, so this is the first study of its kind comparing attitudes in England to those on the Faroe Islands. A survey was carried out in both countries asking questions on housing and lifestyle of dogs, benefits from having a dog and reasons for obtaining one. Two scales for measuring emotional attachment were also used, the Comfort from Companion Animals Scale and an adapted Commitment to Pets Scale. Additionally three professionals in the pet industry were interviewed and data on euthanasia were collected from the Faroe Islands and compared with data from other similar studies. Results showed a highly significant difference in reasons for euthanasia in England and the Faroe Islands ($P < 0.001$) as well as a highly significant association between type of dog and health status at time of euthanasia on the Faroe Islands with a higher number of cross breed dogs being healthy when euthanased. The Commitment to Pets scores were also significantly different in the two countries ($P < 0.001$). Although significant differences were found, the cause of these differences could in most instances not be established, and further research is needed in order to ascertain what influences the results obtained in this study.

Attitudes towards animal use and belief in animal mind: a study of scientists and their opponents

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Research interested in people's beliefs concerning animal mind has included mainly students and laypersons, whilst several studies have examined the views of animal rights activists. Little is known about scientists in terms of their belief in animal mind, yet they are often portrayed by the media and in the literature of their opponents as mostly inclined to reject the possibility of animal mind. The beliefs of this group are an important area of study since they are directly involved with large numbers of animals. The present study included scientists involved in animal research, animal welfare groups, and laypersons. A questionnaire ($n = 372$) measured attitudes toward animal use, and belief in animal mind for thirteen species of animal. All groups were found to rate animals in a way that reflects the phylogenetic scale (ie linear trends were significant), whilst significant quadratic and cubic trends indicated that people tend to group certain species together and attribute to these similar levels of mental competence. Belief in animal mind was highest for the animal welfare group and lowest for scientists, yet scientists believed a number of species to have at least a moderate capacity for cognition, and all thirteen species to have a moderate-high capacity for sentience. Hence the portrayal of scientists as a group that denies the existence of animal mind was not supported by our data. This is a significant finding since people's perceptions of animal mind will have important consequences for the ways in which animals are treated.

Is sleep in animals affected by prior waking experiences?

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The major aims in the study of animal welfare are to try to understand the subjective mental experience of animals, to develop methods to assess their responses to changes in mental state and to use this information to enhance animal welfare. One of the most profound changes of mental state observable in all mammals is the change between wakefulness and sleep. Although sleep is a ubiquitous behaviour in the life of mammals there has been relatively little research on this topic in domesticated animals. Humans spend a third of their lives sleeping, other mammals spend up to 65% of their lives sleeping. Some animals spend much less time asleep; sheep, for example, spend about 17% of their lives

asleep. Animals are motivated to sleep and this motivation increases after a prolonged period of wakefulness. In humans, sleep can be affected by what has occurred in the prior period of wakefulness. An important aspect of human sleep medicine is the association between stress and subsequent sleep disturbances, and there is potential to examine whether these relationships exist in domesticated animals and to study their significance for animal welfare. Characterising animal sleep, and then studying any changes in amount, bout length, distribution or type of sleep after exposure to potentially stressful events can help us understand how animals respond to changes in their environment. Here, we review research into animal sleep and illustrate the associations between sleep and stress that form the basis of my own research into the sleep of sheep.

Cage cleaning regimes and the welfare of laboratory mice (*Mus musculus*)

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With research animals, quality-of-life questions typically centre around the humane application and cessation of experimental procedures. However, even when not undergoing experimental procedures research animals are routinely exposed to intrusive husbandry practices that may affect their welfare. Thus, quality-of-life assessments may also be useful in making decisions about their week-to-week care. Cage-cleaning, for example, elicits numerous physiological and behavioural responses in laboratory mice that suggest they find it aversive — possibly because free-living mice avoid frequently disturbed areas and communicate through odour cues regularly deposited around their environment. However, regular cage-cleaning is necessary to limit the build-up of faeces and urine (and ammonia) and ensure sanitary living conditions. Thus, this research asks if we can improve the psychological well-being of mice by reducing cage-cleaning frequency, and without adversely affecting their health. In this large-scale study, female C57BL and BALB/c mice are being housed for six months in four animal units at Oxford University. Cages contain standard woodchip or 'low-ammonia' (Tek-fresh: Harlan UK) bedding, and are cleaned weekly or fortnightly. To measure psychological well-being, the mice are assessed for physiological stress responses, stereotypy, and performance in a modified elevated plus-maze task. In-cage ammonia levels are monitored regularly, and at the end of the six months, one mouse from each cage is euthanased and nasal, tracheal and lung tissues assessed for ammonia damage. Furthermore, two mice per treatment per unit are fully health screened. This research is currently ongoing, and the results will be presented and discussed with regards to quality-of-life implications of the different cleaning regimes.

Improved scientific validity through improved quality of life: addressing the phenotypic mismatch in laboratory animals

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Responses to experimental challenges in laboratory animals can be of limited reproducibility despite meticulous standardisation. Part of this limitation may stem from a poor consideration of the individual adaptive adjustments brought about during development. Just as the characteristics of the social and physical habitat shape short-term individual reactions, so also they likely determine long-term phenotypic adaptations. Thus, the success of a given phenotype also depends on the correspondence between the neonatal and the adult *milieu*. Concerns can be raised as to whether these mechanisms may bias experimental data. Laboratory rodents are commonly reared under stable and safe pretences typical for breeding facilities; yet, these circumstances poorly predict adult environmental challenges (eg isolation, injections, food deprivation). Thus, a mismatch between an expected safety/stability and the demands actually encountered as experimental subjects may underlie potential aberrant/pathologic phenotypes. Skewing a sample group supposed to reflect the "natural" population (external validity) towards pathology may increase inter-individual variation and, in turn, reduce experimental reproducibility. Alternatively, should a pathological profile be the "norm" within the experimental population, external validity would be at risk despite sufficient reproducibility. Adult laboratory animals exposed to moderate challenges during neonatal life (brief maternal separation, increased foraging demands, physiological levels of corticosterone supplementation), fare better than standard controls on several physiological and behavioural measures (eg HPA activity, anxiety, cognition). This situation may in turn reduce random variation and improve experimental validity and reproducibility. Here we discuss the possibility that systematic neonatal stimulation would improve both animal welfare and quality of experimental data.

Quality of life and improved detection of humane endpoints in laboratory mice

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Many laboratory mice are bred or treated to develop disease, placing a requirement on scientists and animal care staff to decide on humane endpoints. Current endpoints often depend on the detection of obvious clinical signs, eg

weight loss, reduced core temperature, huddling. If behavioural changes that accurately preceded these more obvious signs could be detected, then more sensitive endpoints could be devised, reducing overall suffering. In this study we monitored the home-cage behaviour of genetically modified mice to assess whether early behavioural changes were predictive of later clinical signs of disease or reduced welfare. Ninety-six genetically modified R6/1 mice (which develop Huntington's disease) and 36 wild-type controls were studied. Half the mice were housed in pairs in conventional laboratory cages and half in enriched cages that permitted the performance of 'luxury' behaviours such as climbing and exploration. We predicted that the first signs of reduced welfare would be a decrease in 'luxury' behaviours. Over a period of many weeks, a comprehensive daily screening of body condition, health and behaviour was enacted. Additionally, faecal corticosterone levels were analysed and home-cage behaviour videoed in detail. Mice were humanely killed once they (or matched partners) reached a set of specified conventional criteria relating to disease onset. All mice were subjected to a post-mortem examination, focussing on indicators of stress. Statistical analysis was conducted to determine which changes in home-cage behaviour were most predictive of conventional signs of reduced quality of life.

The response to different environmental enrichments in the common marmoset (*Callithrix jacchus*): comparison among laboratory and zoo colonies

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The aim of this study was to show that different factors, such as the history of a colony and the environmental context, can influence the behavioural needs of captive individuals, and consequently the effectiveness of a particular environmental enrichment. The same enrichments, a movable bridge, a puzzle-feeder and three manipulable objects, were presented to two laboratory colonies and one zoo colony of common marmosets (*Callithrix jacchus*). During the baseline, and during the presentation of the bridge and the puzzle-feeder, data were collected two times daily. The method used was an all-occurrences sampling with 10 min focal animal test. During the enriched phases a 30 s scan sampling on the enrichment was conducted. For the manipulable objects a 15 s scan sampling, with daily session 30 min long, was carried out. An ANOVA was used, and multiple comparisons were performed using the Tukey test. Baseline results showed different activity patterns in the three colonies. When presented with the bridge, the three colonies showed differences in resting locomotion and social activities. In the case of the puzzle-feeder, all of the groups worked at the device to reach the food, but they

differed in effectiveness. The colonies showed age differences in the interest for the manipulable objects, and different object preferences. We can therefore confirm the idea that the different factors can influence the behavioural needs of captive animals, and therefore the effectiveness of a particular enrichment. These results can be useful in planning effective enrichment plans for different captive colonies of non-human primates.

Using cognitive bias to assess affective state in starlings

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In humans it is well established that affective state influences cognition. Depressed individuals typically view circumstances more pessimistically than non-depressed individuals. Here we explore the idea that such cognitive biases may also exist in non-human animals, and could therefore be used as a novel measure of affective state. Captive European starlings were trained to discriminate between two temporal stimuli (2 s white light versus 10 s white light) associated with outcomes of a different value (instant or delayed reinforcement with food respectively). Then, the birds' responses to intermediate stimuli ranging from 2 s to 10 s (1 s increments) were examined under two housing regimes: large enriched cages *versus* small barren cages. The birds' probability of classifying an intermediate stimulus as that associated with the instant food outcome was significantly higher in the large enriched cage compared with the small barren cage. We interpret these findings to suggest that the birds show greater optimism in the face of uncertainty under enriched cage conditions. These results are similar to the findings in both human and other animal studies with respect to cognitive bias. The results also concur with behavioural studies suggesting that environmental enrichment improves welfare. This demonstrates that cognitive bias is an effective means of measuring animal welfare.

The dialogic nature of quality of life in animals and humans

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Assessing the quality of life in humans always rests to some extent on certain assumptions about what counts as the good life. But centuries of moral philosophy have not brought us any closer to easy answers about what those assumptions should be. The premise that motivates most quality of life

measurements is that if we want to know about someone or a certain population's quality of life, then we need to ask them. In the first part of this paper I argue that if a life of quality is something we must necessarily determine by questioning others, then communication is central to quality of life. In the second part of this paper I suggest that issues about animal quality of life hinge on the extent to which they can communicate with us. Furthermore, I argue that many animals can communicate with us and to make this argument I turn to Vicki Hearne's book *Adam's Task*. Hearne argues that in training animals such as dogs, cats and horses we enter into a primitive language-game with them. When we train animals, just as when we train children, we give them a language, which they then transform in a myriad of ways to tell us about themselves. By focussing on communication and its central role in assessing quality of life I conclude that the extent to which we make valid judgements about the quality of life in humans is on a continuum with those same judgements about animals.

Does cortisol provide an objective measure of subjective feelings? Maybe not.

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Cortisol (the end product of activity in the hypothalamic–pituitary–adrenal [HPA] axis) has been traditionally used as a major physiological indicator of stress across the mammalian taxa. Inherent in many welfare studies is the assumption that cortisol provides an objective, quantifiable measure of the subjective feelings of an animal. The HPA axis however is involved in many physiological processes in addition to the stress response. The goal of this study was to assess factors in addition to stress that trigger a HPA response. Our subjects were 40 captive adult *Lemur catta* residing in five stable social groups in different institutions. A total of 767 hours of behaviour data were collected and 903 faecal samples were obtained from which levels of excreted glucocorticoid were quantified. Using multivariate ANOVA and multiple linear regression analysis we assessed the relationships between levels of faecal cortisol and ten variables: sex, time of day, institution, aggression (agonistic attacks initiated), social support available (allo-grooming, contact with others and proximity to others), time spent inside and time spent engaged in anxiety-related activities (self-grooming and locomotion). Individual cortisol levels were significantly modified by institution, time of day, number of agonistic attacks initiated, time spent inside and time engaged in locomotion. Although our results do not negate the use of cortisol as a welfare indicator in *L. catta*, they do highlight

the myriad of behavioural and environmental factors in addition to stress that modify cortisol excretion in this species in captivity. Our results emphasise the challenges associated with using cortisol to monitor well-being and highlight that caution must be exercised when planning experiments to measure welfare in order that confounding variables be minimised.

Development of a composite objective validated scale for assessing pain and health-related quality of life in dairy cows

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A major contributor to poor welfare is pain related to disease. An on-farm study was undertaken to develop a composite scale of pain in dairy cattle, to assess its validity and to explore any associations between pain, disease and behaviour. The major source of pain in ruminant species is probably associated with inflammatory diseases such as mastitis and lameness. A composite pain scale should therefore combine subjective observations with measures of disease severity and associated behavioural observations. A valid, reliable and responsive instrument (structured questionnaire) to measure pain and health-related quality of life in dairy cows has been developed using psychometric and clinimetric methods. An over-riding concern was that any observations should be simple, quick and non-disruptive to the farm routine. To develop this questionnaire, 41 veterinary surgeons, 115 dairy farmers and 10 animal welfare experts suggested words/short phrases to describe the behaviour, demeanour and physical appearance of a lame cow and a cow with mastitis. The content validity was examined by an expert group who were asked to assess the relevance and adequacy of the items selected for inclusion in the instrument and to suggest any additions (or deletions) they deemed necessary. The resulting instrument contains 5 categories (physical appearance, demeanour, movement, measured variables and spontaneous behaviour) for each of the inflammatory diseases of interest with over 100 items in total. It is hoped that pain and health-related quality of life associated with inflammatory diseases can then be measured on a commercial setting in an objective and consistent manner to minimise inconsistencies caused by personal judgements.

Acknowledgements: This study was supported by the BBSRC (Grant no. 17/S15384). Thanks are due to the veterinarians and farmers who assisted with the data collection.

'To TNR or not to TNR' — that is the question

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The efficacy and ethics of trap–neuter–return (TNR) programs as a method of companion animal population control is one of the most contentious issues in animal welfare. Arguments for and against instituting these programs are fuelled by the relative lack of literature verifying measurable improvement in human, wildlife and individual animal welfare as a result of population control against the costs of instituting such programs. The well-being of an individual as a reflection of its ability to cope with its environment can be objectively assessed in terms of physiological and psychological parameters including general body condition, reproductive rate, morbidity and mortality, stress hormone assays, behaviour etc. Other measurable parameters which reflect the welfare of the individual animal, public and wildlife as a consequence of the presence of a roaming companion animal population include the incidence of reported cruelty and neglect cases, incidence of 'hit-by-cars', availability of adequate guardianship, quality of food/shelter, incidence of zoonosis/bites, wildlife abundance/distribution etc. Could a standardised model be developed to objectively quantify the anticipated welfare costs to the individual, public and wildlife as a consequence of roaming animals being returned to their original environment against the benefits of sterilisation surgery to the individual overall? What parameters should be included? Could this model be applied against the ethical justifications of TNR to help determine what is in fact in the individual animal's best interest?

Quality of life screening programme for pet dogs visiting a veterinary practice

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Quality of life assessment in companion animals is in its infancy in comparison to the work completed on farm animals. With the ultimate aim of improving the quality of life of pet dogs visiting veterinary practices a quality of life screening tool was developed. It was important that the tool was both exhaustive (no missing items) and minimal (no unnecessary items) and that consideration was made of both the 'needs' and the 'wants' of the dogs. In addition it was required that the tool was able to be used to monitor changes in quality of life over time and raise awareness of factors affecting quality of life in both

owners and veterinary professionals. A broad approach was taken that focussed both on things provided by the owner (inputs) — diet, exercise, comfort, mental stimulation and companionship, and on the experience of the dog (outputs) — pain, health and emotions. The screening tool made use of owners' ability to provide information about their dog to alert the veterinary team to areas where QoL improvements may be made. Literature review, expert opinion and focus groups were used to refine the tool. The results of a longitudinal study to investigate test–retest reliability will be presented along with the results of validity testing.

Bringing animal welfare to the world through online education

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Recent advances in animal behaviour and evolutionary science have contributed to a widespread acceptance that certain animals may be sentient. This knowledge has changed our views on how we should use animals, and pressure has been put on governments around the world to enforce legislation that takes account of sentience and protects animals from unnecessary suffering. However, among lay people and many specialists working in industries depending on animals, discussion about animal protection is very often based on emotional views rather than current scientific data on animal sentience. Expertise in animal welfare and evolutionary aspects of animal behaviour is mainly concentrated in the western and northern hemispheres and this reflects the imbalance in attitudes towards animals around the world. People's reactions towards the unknown are frequently based on unfounded cultural prejudices, and this is often manifested in outdated attitudes towards animals and their ability to suffer and feel pain. Cambridge e-Learning Institute started with an UFAW grant by a group of animal welfare and behavioural specialists to address these deficiencies. The Institute uses the internet to deliver worldwide online education in animal welfare and a range of courses that provide a better understanding of animals and their evolutionary relations to humans. Courses are integrated into an ethical framework which spans animal behaviour, evolution, zoology, animal ethics and critical thinking. Our courses are aimed at all those who work with animals and want to learn about the latest scientific discoveries. Our tutors are lecturers and specialists from highly regarded institutions around the world. CEI's students have varied backgrounds ranging from people working in animal protection NGOs to PhD students and technical staff in senior positions in national administrations.

Ethical and animal welfare implications of documenting animal habits by video-, audio- or photo-recording

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Naturalistic documentaries are usually regarded as a laudable effort to increase the knowledge of animal behaviour and to spread the concern for endangered species. Nonetheless the production of documentaries is a rather complicated procedure and their making is not free of ethical implications. Moving from a short history of how and when naturalistic documentaries were invented, we try to analyse some of the ethical issues that their making raise nowadays. Broadly speaking, documenting animal habits by audio-visual means implies two kinds of ethical issue. The first one is about its effects on humans. The second one regards the effects on the welfare of the non-human animals involved while the reportage is being made. We will try to highlight the main problems raised within these two broad classes of issue. In particular, we will analyse the question of truthfulness in the depiction of animal life and the effects of the possible anthropomorphic bias. Then we will highlight how the welfare of the animals involved can be jeopardised and how it can be protected. Finally, we will try to argue in favour of a payoff for the animals used in documentaries.

Human–dog communications: an international study of owners

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Attitudes towards animals are influenced by perceptions of an animal's behaviour, and intelligence, which can have both direct and indirect impacts on their welfare. For instance, companion species perceived as being more intelligent may not only be preferred by some potential owners, but the owners may also place greater expectation upon them as a consequence. The aim of this study was to investigate owners' perception of human–dog communication in order to undertake a gap-analysis of public opinion *versus* current scientific knowledge and provide a benchmark for further scientific investigation. A questionnaire was made available on a pet-related website in two languages, Portuguese and English, and advertised to a range of interest groups. Over 5500 dog-owners completed the questionnaire, with seven

geographical regions (eg Australasia etc) each contributing more than 100 respondents leaving 397 other respondents. Owners generally rated the ability of dogs to understand and be understood by humans very highly. There was a strong belief in the ability of dogs to communicate their emotions and desires, with greatest consensus over the dogs' ability to communicate happiness followed by fear and then sadness (all > 90%). There was least consensus over disgust and embarrassment, but more than 40% of owners still believed that dogs could convey these emotions. By contrast a small but notable proportion of owners were not confident that dogs could generalise their learning of commands (< 30%). The wealth of anecdote provided by this survey provides a useful foundation for further research especially into the expression of positive welfare and the complexity of human–dog communication.

An approach to the assessment of quality of life in domestic cats

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Quality of life is about the life experienced by the individual. When evaluating quality of life in domestic cats, the cat's health, the environment in which it lives, and its relationships with others are major factors to be considered.

Health: Historically, feline osteo-arthritis was uncommonly reported in the veterinary literature, but a recent study suggests that it is a common disease. Better recognition of signs of chronic pain in cats will lead to more widespread and judicious use of analgesia.

Environment: Confining cats indoors for their whole life is commonplace in some countries. Compared with the outdoors, an indoor environment is relatively predictable, monotonous and lacking in complexity. It may lead to boredom and stress in a species that is athletic, predatory and curious, and uses well-developed senses to monitor its environment.

Relationships: The cat has evolved from a solitary-living species, yet many households keep more than one cat. Cats are not adapted to living in close proximity to each other, and would normally reduce the likelihood of aggression by dispersing or avoiding each other. This is often not possible in the multi-cat household. Recent evidence suggests that chronic conflict between cats in a home can lead to the development of behavioural and medical problems. Much remains to be discovered about influences on social dynamics between cats.

In addition to the effects of the factors listed above, the individual's characteristics (genetic make-up, degree of socialisation to conspecifics and other animals, life experiences and temperament) must be included in the assessment.

Is cortisol a reliable indicator of well-being?

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Activity in the hypothalamic–pituitary–adrenal (HPA) axis and the concomitant release of the glucocorticoid, cortisol, has been widely used by researchers as a measurement of stress and well-being in animals. Due to the conserved nature of the HPA axis and cortisol, the release of this hormone is affected by many factors in addition to stress. The aim of this study was to determine what factors, outside of the stress response, modify cortisol release in an endangered primate species, the lion-tailed macaque (*Macaca silenus*). Subjects were captive lion-tailed macaques ($n = 34$) housed in four institutions. A total of 188 hours of behaviour data were analysed and 259 faecal samples were collected. An enzyme-immunoassay was developed, validated and subsequently used to quantify levels of excreted cortisol in the faecal samples. The relationship between cortisol and the following variables was assessed using linear stepwise regression analysis and ANOVA: age, sex, institution and a range of behaviours including locomotion, aggression, facial displays, allogrooming and autogrooming. Cortisol levels were significantly modified by the institution in which the subjects were housed and levels of locomotion. Our results indicate that cortisol is significantly modified by fundamental factors outside of the stress response. We recommend that caution be exercised when using cortisol as an indicator of well-being. Cortisol may provide a reliable indicator of well-being only for those species in which we have a thorough understanding of the multiple factors that modify its release.

Profound differences exist in behaviour and physiology across closely related species: welfare implications

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Knowledge of the fundamental behavioural and physiological disposition of a species is an essential pre-requisite to determining the appropriate social and environmental needs, and hence the well-being of captive animals. The goal of our research was to assess the underlying behavioural and physiological disposition of three conservation sensitive, closely related species from the primate family Callitrichidae. The subjects were *Leontopithecus chrysopygus* ($n = 9$), *Saguinus bicolor* ($n = 7$) and *Mico argentatus* ($n = 8$). The research comprised three distinct studies. First, we quantified baseline behaviour in the

subjects across the day, in two seasons (summer and winter) and two environments (caged and semi-free ranging). Second, we assessed baseline HPA physiology in the three species by quantifying levels of urinary cortisol in samples collected across the day, in two seasons and two environments. Third, we monitored the behavioural and HPA response of the subjects under challenge, ie during exposure to novel objects. In total, 240 hours of behaviour data were analysed and 1296 urine samples collected and quantified for levels of urinary cortisol. There were profound species differences in baseline behaviour and cortisol. Baseline behaviour and cortisol also showed species-specific changes across the day, seasons and environments. The species also showed distinct behavioural (but not physiological) responses to novelty. The results highlight profound differences in behaviour and physiology under control and challenging conditions, between three closely related species. The species are traditionally exposed to similar social and physical environments in captivity. Our research suggests, however, that the three species have unique needs despite their taxonomic similarity.

Personality traits, attention and the painful experience

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The bold–shy continuum is thought to be a major factor underlying behavioural variation, with the degree of boldness, or conversely fearfulness, being regarded as a consistent trait throughout contexts. These ‘personality traits’ are thought to reflect different stress coping styles with bold individuals being proactive and fearful individuals being reactive. Stress is problematic in aquaculture with suggestions to selectively breed for boldness, but little is known about the welfare consequences of this strategy. Fish are subject to invasive procedures and recent research has demonstrated their capacity for pain perception. Therefore, we aimed to understand how the degree of boldness affected the responses to painful events within a variety of contexts in the rainbow trout. Bold and shy fish were given an acutely acting pain stimulus. Compared with controls, shy fish took longer to recover in terms of physiology and resuming normal behaviour. In a familiar social context, bold fish did not show adverse changes in physiology; however, they did show a behavioural impairment, being less active and taking longer to assert their dominance by aggression. In a novel social situation, bold fish experiencing pain did not exhibit this suspension in aggression, possibly demonstrating that these fish prioritise social status over displaying signs of pain. Bold fish placed into a novel environment were much quicker to explore and recover than

shy fish experiencing pain. These results suggest that shy fish may 'suffer' relatively more than bold fish and this should be considered when addressing their welfare and quality of life.

Measuring quality of life in kennelled dogs: does a dog's personality correspond with how it copes with confinement?

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This study was undertaken to determine whether the personality characteristics of shelter dogs correspond with their quality of life in kennels. Subjects were 94 dogs, relinquished by their owners to Battersea Dogs' Home (Old Windsor, UK). On their second day in kennels, each dog was subjected to seven behaviour tests, from which five personality ratings were derived: playfulness, excitability, anxiousness, fearfulness and exploration. The personality ratings were found to be reliable (Cronbach alpha range 0.65–0.85), and valid (Spearman Rho range 0.32–0.52). The behaviours displayed by dogs in their kennels were monitored daily for 14 days and urinary cortisol:creatinine (CCR) levels were sampled on days 2, 5, 10 and 17. Dogs that rated high on playfulness, exploration and excitability traits were more likely to display behavioural signs of frustration during the first two weeks (repetitive wall bouncing, play bouncing, tail-chasing, excessive barking, attempts to escape and chewing of bedding). Furthermore, dogs that rated high on the fearfulness trait were more likely to display trembling and a low posture and less likely to jump at the kennel door, compared with low-rated dogs. Significant correlations were found between day 5 CCR levels and playfulness ($\rho = -0.43$) and excitability scores ($\rho = -0.40$), and between day 17 CCR levels and exploration scores ($\rho = -0.60$). These results suggest that profiling dogs' personalities as they enter kennels could allow kennel staff to identify dogs prone to welfare problems before they actually arise, so facilitating a more targeted and pre-emptive approach to welfare management.

Quality of life assessment in dogs living in rescue shelters

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In Italy, sheltered dogs cannot be euthanased unless they are infected with untreatable or contagious diseases or unless they are dangerous for people and other animals (National Law 281/91). Adoptions do not compensate for the number of dogs entering the shelters, thus most of the dogs that have already spent a long period at the shelter stay there until they eventually die. Dogs housed in rescue shelters face conditions of social deprivation, boredom, lack of control and frustration. It cannot be ignored that living in such conditions may cause stress to dogs and impair their quality of life. Our study, integrating behavioural and physiological parameters, focussed on: (1) dogs entering the shelters and their adaptation to the new environment; (2) dogs that have already spent three years at the shelter tested before and after a two-month-long environmental enrichment programme; (3) the capacity of adopted dogs to form an attachment bond with their new owners. The latter was achieved by comparing adopted dogs and dogs still living in the rescue shelter using the Strange Situation Test to measure their affectional demand to human caretakers. The results describe a complex situation in which inter-individual variability and past experiences play an essential role in affecting the dogs' quality of life in the shelter. A long duration in shelters did not impair their capacity to form new attachment bonds even though dogs showed signs of a less secure affectional bond and of a less playful attitude.

Comparison of tethering and group-pen housing for sled dogs

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The experiment investigated whether there was a difference in sled dogs' behaviour after long-term tethering without exercise, long-term tethering with exercise, or group-pen housing. Siberian husky sled dogs from a commercial sled-dog kennel ($n = 9$) were exposed to four different housing conditions and filmed to record behaviours for analysis. Filming took place at the sled-dog kennel. The conditions consisted of six months with no exercise/tethered (Condition A), exercise (daily running)/tethered (Condition B), four weeks no exercise/tethered (Condition C) and no exercise/un-tethered in group pens with three dogs per pen (Condition D). The dogs were returned to baseline (Condition A) after three months in group-pen housing to control for order effects. Subjects were then filmed after a two-week habituation period. The tethered housing conditions (A, B and C) produced evidence of more repetitive behaviours and fewer social behaviours than the un-tethered housing condition. Although un-tethering subsequently reduced rebound and repetitive behaviours, the variable of tethering without exercise (conditions A and C) revealed the greatest difference in behaviour. Long-term tethering with no exercise produced agonistic behaviours indicative of

frustrative non-reward heightened by the intermittent delivery of the reward of exercise. Increased aggression vigorously directed at neighbouring dogs and an overall increase in vigilance was the direct consequence of the frustration of non-reward. Un-tethering significantly reduced inter-dog aggression ($P = 0.05$), but the dogs remained vigilant. Therefore, long-term tethering without exercise or with the intermittent reward of exercise produces an increase in frustrative maladaptive behaviours such as aggression and increased vigilance.

Should quantity of life be valued within either legislation or welfare codes?

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Current (and planned) UK legislation and welfare codes contain no consideration of quantity-of-life issues, most notably killing. This contrasts with medical Law (and its basis in medical ethics) and non-UK EU Law such as in Austria. In the English constitution, this omission amounts to an unconstrained permission to end the lives of animals

one possesses, if performed humanely. This has led to cases such as *Patchett versus MacDougal* where the wanton, malicious killer of a pet dog was unprosecutable, as well as more general disquiet over the terms of our duty of care. Indeed, there is even a tacit pressure in some systems to deliberately shorten lives in order to shorten suffering. The paper comprises: an assessment of the current UK, EU and US legal positions on our treatment of animals and life-and-death decisions and whether incorporating quantity-of-life considerations would be possible theoretically and practically; analysis of what is meant by 'valued' (direct and indirect value, absolute and relative value etc); and a comprehensive survey of contemporary ethical positions on treatment of animals and quantity-of-life considerations and how they balance with quality-of-life considerations. It concludes that a value can be placed upon quantity-of-life :

- As a marker for animal welfare
- As extreme (infinite/exponential) utility
- As a preference/need for satisfaction
- As a necessary medium for utility/welfare
- As an objective value outside of welfare, in that one might value actions/intentions which respect quantity of life due to virtue-theory, deontological positions, rights-based ethics etc with the result that morally, causing a decrease in quality-of-life killing should require justification, both from inside and outside a solely quality-of-life perspective.