

RSPCA AUSTRALIA SCIENCE UPDATE

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The aim of the animal welfare science update is to keep you informed of developments in animal welfare science relating to the work of the RSPCA. The update provides summaries of the most relevant scientific papers and reports received by the RSPCA Australia office in the past quarter.

RSPCA AUSTRALIA SCIENTIFIC SEMINAR 2011

All work and no play? Modifying the behaviour of animals

Tuesday 22 February 2011, CSIRO Discovery Centre, Canberra

The 2011 Scientific Seminar will explore the animal welfare implications of training animals by asking how our attempts to modify animal behaviour affect the animals themselves. Is making animals work for our own purposes justified? How do we motivate animals to perform, or behave the way we want them to, and do any of them actually enjoy it? Can we use training to improve the welfare of individual animals? And are the training methods used always acceptable, even when they are out of public view?

The Seminar will present the views of a range of experts in animal behaviour and training with experience with companion animals, working animals, livestock, and zoos. The Seminar will be chaired by Professor Paul McGreevy, who holds a chair in animal behaviour and animal welfare science at the University of Sydney.

Visit the Scientific Seminar [website](#) for more information, including the program and registration form.

COMPANION ANIMALS

Bigger cages for pet rabbits

There are regulations that dictate cage sizes for farmed and laboratory rabbits, but pet rabbits are often housed in hutches that are far smaller than the minimum legal limit. As a result, they may not be able to perform certain natural behaviours freely, and their welfare may be negatively impacted, especially if the animals are housed singly. In this study, the researchers investigated the behaviour of companion rabbits in three different cage sizes, to assess the welfare outcomes of each cage size.

It was found that rabbits were generally more active and interacted more with environmental resources in larger pens (1.68 to 3.35m²) compared with smaller pens (0.88m²). Also, when moved from a smaller pen to a larger one, rabbits initially showed higher than normal activity levels (a rebound effect). These results indicate that when housed in small pens, rabbits are unable to perform activities that they would normally engage in, which has a negative effect on their welfare.

Dixon, L. et al. (2010) The effects of spatial restriction on the behavior of rabbits (*Oryctolagus cuniculus*), *Journal of Veterinary Behavior*, 5: 302-308.



FARM ANIMALS

Osteoporosis and bone fractures in layer hens

The Farm Animal Welfare Council in the United Kingdom has released an [opinion on osteoporosis and bone fractures in layer hens](#) outlining the implications for layer hen welfare in light of the ban on conventional cages in Great Britain.

Light intensity and broiler welfare

Broiler chickens are commonly reared at high densities in indoor settings under artificial light. While it is widely acknowledged that stocking density can have a significant impact on broiler welfare, it is still unclear what the optimal light intensity might be. In this study, broilers were reared under four different light levels, ranging from 1 lux to 40 lux, from 8 to 35 days of age. All chicks were given 17 hours of light per day.

The researchers found that light intensity had no effect on body weight, feed consumption, feed to weight gain ratio, or mortality. However, high light levels resulted in lower carcass, thigh and drum yields. Low light chickens had heavier wings, but also increased levels of ulcerative footpad lesions and larger eyes. This can be attributed to the lower activity levels in the chickens under dim light conditions. Overall, therefore, light did not have a significant effect on the production of broilers, but very low light seemed to result in negative welfare outcomes.

Deep, A. *et al.* (2010) Effect of light intensity on broiler production, processing characteristics, and welfare, *Poultry Science*, 89(11): 2326-2333.



Chronic environmental stress and growing pigs

In the United Kingdom, more than 75% of all commercial pigs are housed indoors in intensive commercial systems. In such farms, pigs may be exposed to a variety of environmental stressors such as loud noises, low light and high levels of the gas ammonia on a daily basis. As each of these stressors can have a negative impact on animal welfare, this pair of studies examined the effects of these stressors, individually and in combination, on over 200 four-week-

old hybrid female pigs, over a period of 15 weeks. The measurement of physiological indicators of stress confirmed that high ammonia levels had an adverse effect on the animals' welfare, especially in dark and noisy environments. Young pigs housed in high-ammonia rooms also played less with each other, and had more health problems, in the form of discharge from their nose and eyes. However, productivity measures such as growth and feed intake were not affected by any of the stressors.

Apart from health-related impacts, environmental stressors can also have a negative effect on the social structure of pigs. Pigs can tell other pigs apart from an early age, and normally form stable social groups. Although pigs are normally aggressive to new animals from outside their group, they are able to recognise their own littermates through a range of sensory cues and behavioural displays. Examining the effects of ammonia, low light and noise on social structure, the researchers found that once again, high ammonia and low light had the greatest effect, causing pigs to be more aggressive at an early age. This was particularly true for pigs exposed simultaneously to the two stressors. Pigs exposed to high noise levels also showed a greater tendency to react aggressively to littermates. The authors of the two papers warn that many other factors, not investigated in these studies, may interact with each other in real farm settings, and create negative welfare situations.



O'Connor, E. *et al.* (2010) The impact of chronic environmental stressors on growing pigs, *Sus scrofa* (Part 1): stress physiology, production and play behaviour, *animal*, 4(11): 1899-1909.

Parker, M. *et al.* (2010) The impact of chronic environmental stressors on growing pigs, *Sus scrofa* (Part 2): social behaviour, *animal*, 4(11): 1910-1921.

Enrichment and piglet feed intake



Following weaning, piglets are often reluctant to eat solid food, especially if they have not had the opportunity to learn appropriate behaviours from older individuals. This can have negative effects on their health and welfare, as well as on farm production. In current farming systems, piglets are often reared in barren weaning pens, while the sow is confined to a crate. Piglets therefore have almost no chance of observing and practicing the normal behaviours that may help the transition to solid food.

The authors of this paper investigated the effects of providing enrichment and allowing the sow to move freely on the growth, health and welfare of piglets around the time of weaning. Enrichment involved the provision of materials such as wood shavings, straw, peat and small branches in the weaning pens. In the pens where the sow was allowed to move freely, the farrowing crate was removed four days after farrowing. Over 300 piglets and 30 sows were investigated in this study. The researchers found that piglets raised before weaning in enriched pens, or with free-moving sows, grew faster. After weaning too, piglets raised in enriched pens grew faster, and had a greatly reduced incidence of diarrhoea. The authors conclude that an enriched environment and the observation of normal maternal feeding behaviour may help improve piglet nutrition, growth and welfare.

Oostindjer, M. *et al.* (2010) Effects of environmental enrichment and loose housing of lactating sows on piglet performance before and after weaning, *Journal of Animal Science*, **88**(11): 3554-3562.

Comparing four housing systems for layer hens

In the UK, approximately 33 million hens are reared for egg production under a range of housing conditions, including cages, furnished cages, barns and free-range. Scientists often perform controlled trials to investigate the welfare impacts of a particular type of housing, but there are very little comparable data on the welfare of hens in commercial situations. In this study, the researchers used a combination of direct observation, as well as questionnaire reports from egg producers, to assess the welfare of hens from 26 flocks housed under four different conditions.



It was found that, although each housing system had both positive and negative aspects, hens in barn systems had the highest prevalence of poor plumage condition, old fractures, emaciation, abnormal egg calcification, and the highest stress levels. Hens in conventional cages sustained more fractures at slaughter than birds in other systems. Vent pecking was most prevalent in free-range flocks. The lowest prevalence of problems occurred in hens in furnished cages. However, because hens in all four systems showed signs of poor welfare (such as emaciation, loss of plumage, fractures and evidence of stress), the researchers suggest that modern breeds are simply not well suited to commercial egg production systems.

Sherwin, C. *et al.* (2010) Comparison of the welfare of layer hens in 4 housing systems in the UK, *British Poultry Science*, **51**(4): 488-499.

Electrical stunning of chickens

Broiler chickens are routinely stunned prior to slaughter by being dipped in a bath of electrified water. Next, they enter the mechanical throat-cutting procedure followed by feather removal in scalding hot water. There may be many technical flaws in such a complex system, and these flaws may lead to high levels of stress and suffering for the animals being slaughtered. For instance, birds may receive painful electric shocks before they are stunned, or they may still be conscious when dropped into the scalding tank. They also become obviously distressed when attached upside down to the shackles by their feet. In addition, this procedure can result in unusable carcasses, and may also present occupational safety issues to human handlers, who are exposed to dust, feathers, pathogens and faeces when loading the chickens.

As an alternative to electrical stunning, the authors of this paper suggest the more humane method of controlled



atmosphere killing (CAK), where birds are subjected to a mixture of gases, of which the toxic gas carbon dioxide is the chief ingredient. The advantages of this method are numerous: birds experience minimal handling, and if the gas composition is carefully controlled, also show few signs of stress and discomfort. While the exact nature of the gas mixture is critical to ensuring improved welfare, CAK eliminates the problems associated with handling and shackling conscious birds, painful pre-stun shocks, and variations in current that may or may not render birds unconscious and insensible, without causing avoidable pain and suffering.

Shields, S. and Raj, A. (2010) A critical review of electrical water-bath stun systems for poultry slaughter and recent developments in alternative technologies, *Journal of Applied Animal Welfare Science*, **13**: 281-299.

Tail biting in pigs

Pigs reared in intensive commercial systems often display abnormal tail-biting behaviour, repeatedly grasping at the tails of nearby animals with their mouths. The severity of this behaviour can range from simply holding the tail gently between the teeth to aggressive attacks which can remove skin and flesh, or even amputate parts of the tail, potentially leading to infection and death. The authors of this review paper point out that there are three main types of tail biting: (1) two-stage tail biting, which starts off as gentle manipulation, but later becomes damaging; (2) sudden forceful tail biting, where the tail is seized and yanked or bitten forcefully, and without warning; and (3) obsessive tail-biting, where individuals become fixated on continuously biting other pigs' tails.



These different types of abnormal behaviour may have different causal factors, including a lack of suitable housing and/or enrichment, inappropriate feed or feeding habits, or stocking density. Some pig breeds are also more susceptible to such behaviour. The authors suggest that tail biting should be viewed as a collection of different abnormal behaviours, and should be treated with the appropriate intervention, once the causal factors have been identified.

Taylor, N. *et al.* (2010) Tail biting: a new perspective, *The Veterinary Journal*, **186**: 137-147.

Diet and fin damage in farmed salmon

Commercially farmed fish such as Atlantic salmon can experience fin damage due to a number of reasons, including physical contact with netting or the sides of the tank, or aggression caused by a high stocking density. Fin damage can lead to the outbreak of infections among farmed animals, and cause serious economic losses. In this study, the researchers investigated whether periods of feed restriction, during sampling, grading and transport of farmed fish, can also lead to aggression and subsequent fin damage.

Eight groups of fish, each containing six Atlantic salmon, were divided into a feed restricted group and a control group, and observed for 30 days. Dorsal fin damage was only seen in feed restricted groups, and was positively correlated with aggression and fin biting. Feed-restricted fish exhibited significantly lower weight gain, reduced growth rate and body condition. Using a technique known as social network analysis, the researchers determined that there were higher and more intense aggressive interactions in feed-restricted fish. In these groups, individuals could be subdivided into two categories, based on their behaviour: fish initiating aggressive interactions had less fin damage, gained more weight and attained more central positions within the school, while fish receiving aggression had more fin damage and gained less weight.



Jones, H. *et al.* (2010) Social network analysis of behavioural interactions influencing fin damage development in Atlantic salmon (*Salmo salar*) during feed-restriction, *Applied Animal Behaviour Science*, **127**: 139-151.

ANIMALS USED FOR SPORT, ENTERTAINMENT, RECREATION AND WORK

Australian Working Dog Survey Report 2009

The first major study of Australian working dogs has just been released looking at the training and treatment of dogs used for work and sport.

The study, commissioned through the Australian Animal Welfare Strategy, looked at four types of working dogs: private industry (farm, hunting, guard etc); Government (Customs, Quarantine, Defence); assistance/service (guide, hearing, search and rescue); and sport (greyhound, sled, sheep trial etc).

The full report can be accessed here: <http://www.daff.gov.au/animal-plant-health/welfare/reports>



Guardian Dogs: Best Practice Manual for the use of Livestock Guardian Dogs

The Invasive Animals Cooperative Research Centre has just released a publication regarding the management and care of livestock guardian dogs. The complete manual is available here: <http://www.invasiveanimals.com/wp-content/uploads/2010/09/Guardian-Dogs-web.pdf>

Does hand-feeding cause behavioural problems in horses?



Equestrian professionals often recommend that horse owners avoid hand-feeding their horses, either in everyday situations, or as a reward during clicker training. It is believed that the act of feeding horses by hand leads them to pick up unwanted bad behaviours, such as licking and nipping hands, searching people's clothing either gently or roughly, or biting at clothing. However, many horse owners experience no such problems with their hand-fed animals. The authors of this article therefore used survey data from over 1,000 horse owners in the United Kingdom, to determine if there was a relationship between hand-feeding and unwanted behaviours.

Ninety-one percent of respondents reported giving their horse food by hand, and this practice was significantly associated with three behaviours, namely licking hands, gently searching clothing and roughly searching clothing. However, the more offensive behaviours, nipping and biting clothing, were not implicated. Clicker training techniques were employed by 14% of respondents and their use was not associated with the incidence of any of the unwanted behaviours. The authors suggest that horse owners should freely use food-based positive reinforcement when training their animals.

Hockenhull, J. and Creighton, E. (2010) Unwanted oral investigative behaviour in horses: A note on the relationship between mugging behaviour, hand-feeding titbits and clicker training, *Applied Animal Behaviour Science*, **127**: 104-107.

Preventing horse-related human injuries

Horse riding is generally acknowledged to be a dangerous pastime, and injuries incurred in horse-related incidents can be very serious or even fatal. In this review article, the authors summarise the available research on horse-related human injuries from the past 20 years, and suggest that many such injuries can be prevented primarily by a better understanding of horse behaviour.

Among injured horse riders, females generally predominate in younger age groups, but males are more highly

represented in older age groups. People aged less than 35 years are more likely to be injured than other age groups, with riding accidents typically occurring within 3 years of the rider's first horse riding experience. The authors suggest that simple strategies including wearing protective gear and using gentler bits may help prevent certain kinds of incidents. In addition, paying more attention to understanding the horse's behaviour may be key to avoiding a wide range of accident scenarios. For instance, novice riders could be matched with breeds that are known to have lower anxiety and excitability, while training horses to have good acceleration and deceleration responses should become a part of everyday horse-human interactions. A handler's state of mind can affect a horse's behaviour, while an inexperienced rider can have a negative effect on a horse's gait. Thus, both handlers and riders need to be trained in understanding horse behaviour.

Hawson, L. *et al.* (2010) The roles of equine ethology and applied learning theory in horse-related human injuries, *Journal of Veterinary Behavior*, 5: 324-338.

Crib-biting in horses



Crib-biting is a stereotypic behaviour shown by captive horses, and is thought to be indicative of poor welfare. Horses exhibiting crib-biting behaviour anchor their top incisor teeth on a fixed object (e.g. fence, stall or building structures), pull backward, contract the neck muscles, and draw air into the food pipe, emitting an audible grunt. Crib-biting behaviour has been linked with unthriftiness (weight loss and poor condition) in horses, and also with excessive tooth wear. Many causes have been suggested for the development of crib-biting, including imbalances in brain chemicals, genetic causes, inappropriate housing and lack of social opportunities. It has also been shown that horses fed on high concentrate, low forage diets also tend to crib-bite as a way to ameliorate the symptoms of gastric ulcers that occur as a result of stomach acidity. In such cases, the administration of antacids may reduce the incidence of the stereotypy.

Horse handlers often try to stop horses from crib-biting through interventions such as removing the cribbing surfaces, applying repellents or using electric wire, cribbing straps and muzzles, aversion therapy and the surgical removal of the paired omohyoideus and sternothyrohyoideus muscles and transection of the accessory nerves, a procedure known as modified Forssell's technique. The authors of this review article argue that such measures fail to address the underlying cause of crib-biting, and may further reduce a horse's welfare, particularly if the stereotypy allowed the horse to cope with stress or discomfort.

Wickens, C. and Heleski, C. (2010) Crib-biting behaviour in horses: a review, *Applied Animal Behaviour Science*, 128: 1-9.

RESEARCH ANIMALS

Housing and care of zebrafish

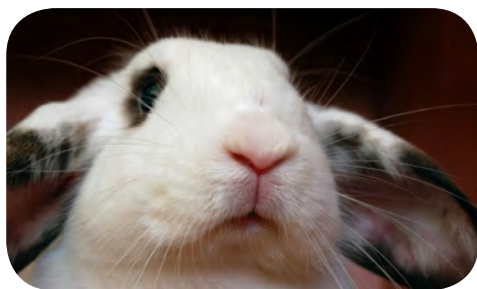
RSPCA UK has launched a new publication titled Guidance on the housing and care of zebrafish to help improve the welfare of zebrafish used in research. The guide aims to:

- facilitate understanding of zebrafish behaviour and their requirements
- highlight welfare considerations relating to breeding, supply, housing and care
- identify, where possible, consensus for appropriate environmental and care conditions
- provide recommendations for improving health, welfare and egg quality, and for reducing the potential for stress and suffering
- stimulate discussion and research to identify 'good practice' in areas where current knowledge is sparse or inconclusive

The guide is available here: <http://www.rspca.org.uk/ImageLocator/LocateAsset?asset=document&assetId=1232723034494&mode=prd>

Mirrors for rabbit welfare

Rabbits are a commonly used laboratory animal, and in the vast majority of situations, they are kept singly in cages. This can be for ease of cleaning and maintenance, or because certain experimental protocols require that animals not be mixed with other individuals. In addition, male rabbits often cannot be housed in groups because of the potential for aggressive interactions, which can also reduce their welfare. Rabbits are social animals, and when housed singly, they often develop stereotypic behaviours such as excessive grooming; this is particularly obvious when the cages are bare (lacking in enrichment).



In this study, the researchers investigated whether installing small acrylic mirrors in cages containing solitary rabbits had any effect on their behaviour or stress levels. It was found that mirrors were able to mimic the presence of another rabbit, and reduce excessive grooming, at least in the case of female rabbits. No such effect was observed in male rabbits. The authors concluded that mirrors can be used to improve the welfare of female rabbits, and suggest that future studies also investigate male and female animals separately, in order to bring to light gender-based differences.

Edgar, J. and Seaman, S. (2010) The effect of mirrors on the behaviour of singly housed male and female laboratory rabbits, *Animal Welfare*, 19: 461-471.

WILDLIFE

Preventing poisoning of native mammals

Poisoned baits are used in many parts of Australia as an effective way of controlling feral pig populations. One unfortunate side effect of this practice is that small native mammals may also find and consume these baits, and die. Forestry managers often use a range of strategies to protect certain resources or places from wild animals: these include chemical substances that mimic the smell of certain predators, and thus keep all prey species away. However, in the case of feral pigs, it is much more difficult to make the baits attractive to the pest species, while keeping away other animals that might also want to feed on the baits. In this study, strategies, such as putting lights around bait stations, and playing the recorded calls of dingos, were trialled for their ability to keep away native forest mammals.

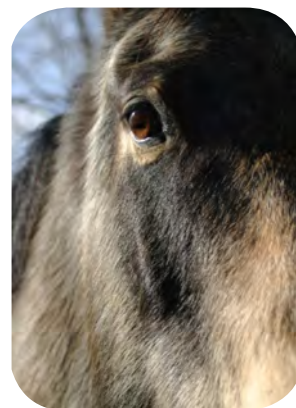
The researchers found that illuminating the inside of the bait box with six white 12V LEDs reduced the foraging intensity of small mammals on sunflower seed bait by 25%, and on unprocessed corn-based feral pig bait by 80%. On the other hand, the consumption of bait by feral pigs remained unchanged. Playback of dingo call recordings had no effect on bait consumption by small mammals. The authors conclude that the illumination of baiting sites is an effective means of preventing small native mammals from being accidentally poisoned.

Bengsen, A. et al. (2010) Artificial illumination reduces bait-take by small rainforest mammals, *Applied Animal Behaviour Science*, 127: 66-72.

Immunocontraception of feral horses

Immunocontraception by means of porcine zona pellucida (PZP) injections is used as a common means of rendering the females of many animal species infertile. This is seen as a humane and convenient way of controlling populations of feral animals, as the PZP can be delivered by means of a dart, and the treatment only causes a temporary period of infertility. However, there is evidence that feral horses treated with PZP develop a propensity to frequently move from one male's harem to another. This may lead to a breakdown of social structure in this highly social animal, and create negative welfare outcomes.

In this study, the researchers investigated the effects of PZP treatment on the mares of a population of feral horses in North Carolina, USA. They observed the behaviour of



the mares in the 2007 and 2008 breeding seasons, and consulted records on the contraception histories of each individual. It was found that mares that had been treated with PZP changed harems more frequently than those that had not. Mares that had been treated over several years were no more likely to change harems than mares that had only been treated once. Additionally, mares showed higher infidelity even if their last treatment had been administered several years ago. The researchers conclude that PZP treatment has a significant effect on harem stability, and that that once a mare has been given this contraception the behavioural effect of the contraceptive treatment may not be readily reversed.

Madosky, J.M. *et al.* (2010) The effects of immunocontraception on harem fidelity in a feral horse (*Equus caballus*) population, *Applied Animal Behaviour Science*, **128**: 50-56.

Immunocontraception of feral horses – effects on the reproductive cycle

Porcine Zona Pellucida (PZP) is currently administered as an immunocontraceptive to a wide range of species, including white-tailed deer, elk, black bears and African elephants. However, studies on a population of feral horses in North Carolina, USA, have shown that PZP can cause not only social instability, but can also seriously alter the reproductive physiology of target animals, with potentially negative welfare outcomes. Using foaling data obtained from the local National Park Service, the authors of this paper compared the time of foaling for mares before and after the administration of PZP.

Covering a total of 12 years, the data showed that mares that had been treated with PZP were more likely to foal later in the year. More doses of PZP given to a mare led to an even more delayed foaling, while current recipients of the immunocontraceptive also foaled later than those who had received it in previous years only. One possible explanation is that mares receiving PZP tend to be in better physical condition than mares with foals (because of not having to produce milk), and can therefore keep their reproductive cycles going later in the year when the contraceptive starts to wear off. However, this can mean that foals that are born closer to winter may not survive, while mares in a harem get harassed for longer by sexually active males. The authors suggest breaks of one or more seasons between successive doses of PZP, in order to allow the target mares' physiology to operate as normally as possible.

Nunez, C. *et al.* (2010) Immunocontraception in wild horses (*Equus caballus*) extends reproductive cycling beyond the normal breeding season, *PLOS One*, **5**(10): e13635. doi:10.1371/journal.pone.0013635.

TRANSPORTATION OF ANIMALS

Ammonia gas in long-distance ship transport of steers

Steers transported by ship from Australia to the Middle East may be exposed to high levels of ammonia gas in the air for up to two weeks. The effects of ammonia on cattle are still unclear, especially in the context of transport by sea. In this study, therefore, the behavioural and physiological responses of steers to a range of ammonia levels under simulated sea transport conditions were investigated for a period of 12 days. Animals were held under a climate and stocking density similar to shipboard conditions experienced from Australia to the Middle East during the northern hemisphere summer.



Investigations on the lungs of the experimental animals revealed that the concentration of certain types of white blood cells was increased in response to high ammonia levels. This indicated inflammation of the lung tissue. Ammonia also increased coughing and secretions from the nose and eyes, indicating that the ammonia was irritating the animals' mucous membranes. The authors recommend that the critical ammonia exposure limit for steers should be less than 23 mg/m³, and that a safer limit should be 19 mg/m³.

Phillips, C. (2010) The physiological and behavioural responses of steers to gaseous ammonia in simulated long-distance transport by ship, *Journal of Animal Science*, **88**(11): 3579-3589.

MISCELLANEOUS

Pain in fish

Fish are vertebrates like humans, mammals and other animals such as reptiles and amphibians. As a result, the nervous system including the brain of fish, are in many ways similar to those of all other vertebrates. On the other hand, there are also some significant differences between the brains of these animal groups, and this has led scientists and the public to fiercely debate whether fish are capable of experiencing what humans would call pain. In this review article, the author discusses the various similarities and differences between fish and other vertebrate nervous systems, and describes the pharmacological means by which the negative impacts of aversive stimuli (those that would cause pain to humans) can be reduced in fish.



Fish have many of the same nerve endings present in mammals that are associated with pain perception. When subjected to 'painful' stimuli, fish will also display behaviours (such as avoidance, loss of appetite, rubbing the affected part of the body against a substrate, etc) that suggest that they perceive such stimuli as unpleasant. However, fish brains lack a structure, called the neopallium, which is thought to be the part of the mammal brain that processes painful sensations. The debate continues, but the author strongly recommends that signs of distress in fish should be treated with appropriate veterinary care, as they would be in any other animal.

Weber, E. (2010) Fish analgesia: pain, stress, fear aversion, or nociception? *Veterinary Clinics of North America: Exotic Animal Practice*, **14**(1): 21-32.

ARTICLES OF INTEREST

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