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MORE THAN ONE BILLION ANIMALS KILLED IN AUSTRALIAN BUSHFIRES

PROFESSOR CHRIS DICKMAN HAS REVISED HIS ESTIMATE OF THE NUMBER OF ANIMALS KILLED IN BUSHFIRES IN NSW TO MORE THAN 800 MILLION ANIMALS, WITH A NATIONAL IMPACT OF MORE THAN ONE BILLION ANIMALS.

In January Professor Dickman, from the University of Sydney's Faculty of Science, estimated that 480 million animals would be killed by the fires. With the fires having now continued and extended their range he has updated that figure including putting the impact nationally at more than one billion animals.

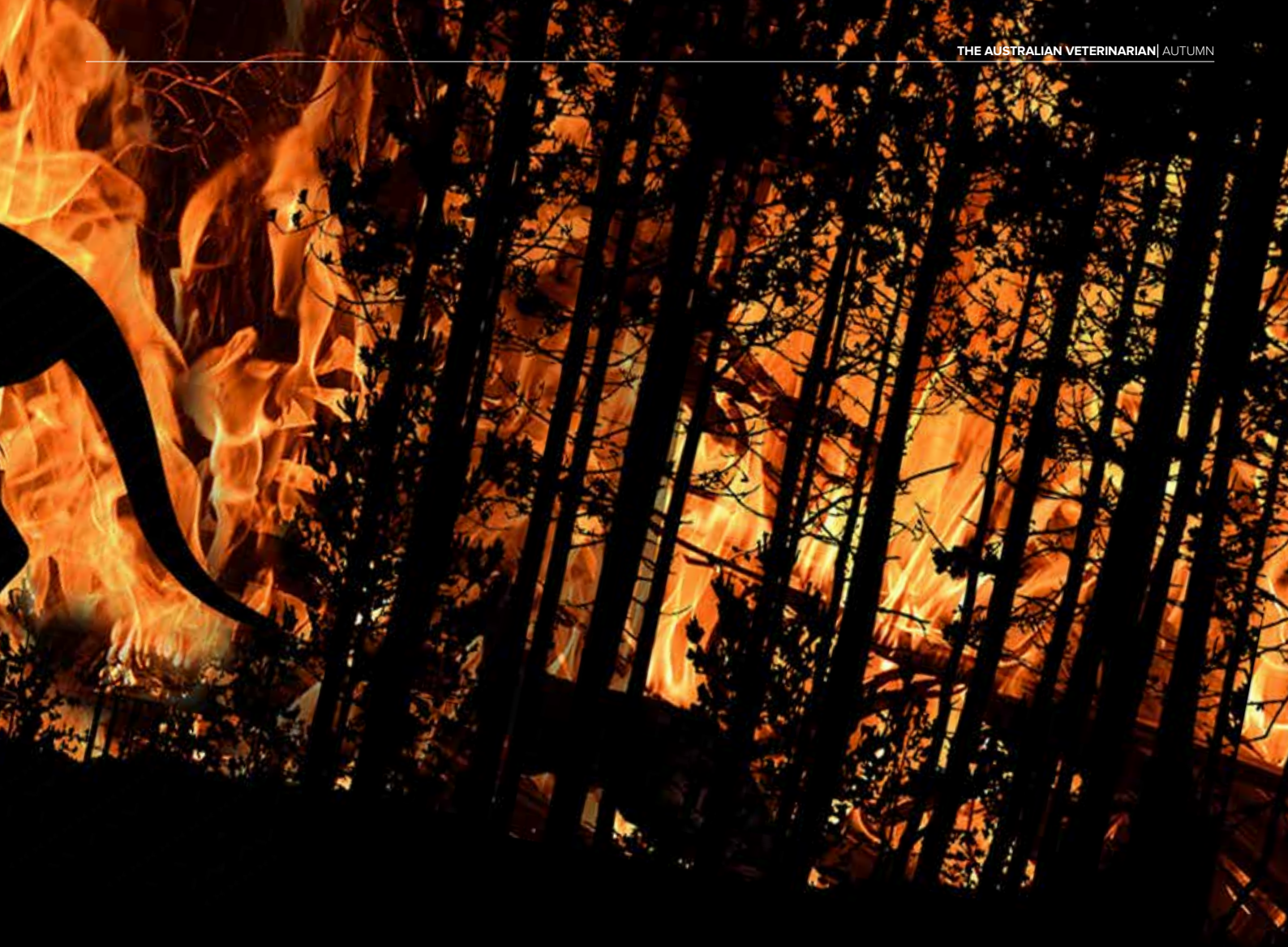
Speaking to National Public Radio in America Professor Dickman said, "I think there's nothing quite to compare with the devastation that's going on over such a large area so quickly. It's a monstrous event in terms of geography and the number of individual animals affected."

"We know that Australian biodiversity has been going down over the last several decades, and it's probably fairly well known that Australia's got the world's highest rate of extinction for mammals. It's events like this that may well hasten the extinction process for a range of other species. So, it's a very sad time.

"What we're seeing are the effects of climate change. Sometimes, it's said that Australia is the canary in the coal mine with the effects of climate change being seen here most severely and earliest... We're probably looking at what climate change may look like for other parts of the world in the first stages in Australia at the moment," said Professor Dickman from the Faculty of Science.

"I think there is a feeling among environmental scientists and ecologists in Australia that we've been frozen out of the debate, certainly out of policymaking. I think it's now time to bring the scientists back into the tent to look at what is likely to be happening over the next few decades and to think about how we can maintain both the human community in good health and as much biodiversity as can be retained under this evolving situation."

Professor Dickman explains that animals that survive the fires in the first instance by fleeing or going underground will return or re-emerge into areas that don't have the resources to support



“I think there’s nothing quite to compare with the devastation that’s going on over such a large area so quickly. It’s a monstrous event in terms of geography and the number of individual animals affected.” Professor Chris Dickman

them. Others will fall victim to introduced predators such as feral cats and red foxes. Even for those birds or animals able to flee to unaffected areas they will rarely be able to successfully compete with animals already living there and succumb within a short time.

How the figures were calculated

The figures quoted by Professor Dickman are based on a 2007 report for the World Wide Fund for Nature (WWF) on the impacts of land clearing on Australian wildlife in New South Wales.

To calculate the impacts of land clearing on the State’s wildlife, the authors of that report obtained estimates of mammal, bird and reptile population density in NSW and then multiplied the density estimates by the areas of vegetation approved to be cleared.

Estimates of density were obtained from published studies of these animal groups in NSW and from studies carried out in other

parts of Australia in similar habitats to those present in NSW.

The authors deliberately employed highly conservative estimates in making their calculations. The true mortality is therefore likely to be substantially higher than those estimated.

The figure includes mammals (excluding bats), birds and reptiles and does not include frogs, insects or other invertebrates. NSW’s wildlife is seriously threatened and under increasing pressure from a range of threats, including land clearing, exotic pests and climate change.

Australia supports a rich and impressive diversity of mammals, with over 300 native species.

Some 34 species and subspecies of native mammals have become extinct in Australia over the last 200 years, the highest rate of loss for any region in the world.

PREVENTING ADVERSE DRUG REACTIONS IN DOGS

If not identified before surgery, a rare genetic mutation could result in dogs being exposed to dangerously high levels of anaesthetic agents.

Scientists at Washington State University's College of Veterinary Medicine initially discovered the mutation in greyhounds and more recently in other common dog breeds.

The research group, a member of the Program in Individualised Medicine (PrIMe), published its findings last week in Scientific Reports.

For years, veterinarians have known that some greyhounds struggle to break down certain drugs, which results in potentially life-threatening and prolonged recovery periods following anaesthesia.

The previously unknown genetic mutation that the WSU researchers uncovered in greyhounds causes less of CYP2B11, the enzyme that breaks down these drugs, to be made.

Not surprisingly, the mutation was also found in several other dog breeds that are closely related to the greyhound including borzoi, Italian greyhound, whippet, and Scottish deerhound.

However, when the research team extended their survey to more than 60 other breeds, using donated samples from the WSU Veterinary Teaching Hospital DNA Bank, they were surprised by what they found.

According to the study, funded by the American Kennel Club's Canine Health Foundation, some popular dog breeds, including golden retrievers and Labrador retrievers, may also struggle to break down the commonly used anaesthetics, midazolam, ketamine, and propofol.

"We started with a condition we thought was specific to greyhounds and affected a relatively small number of dogs," said Stephanie Martinez, postdoctoral research associate and lead author on the study. "It now appears that there could be a lot

more dogs affected by this mutation - dogs from breeds that we wouldn't have expected."

The study found about one in 50 golden retrievers and one in 300 Labrador retrievers may have low amounts of CYP2B11. According to the American Kennel Club, Labrador retrievers are the most popular breed of dog in the U.S., closely followed by golden retrievers, ranked third.

Even mixed-breed dogs were not spared; although the prevalence was much lower at only one in 3,000 dogs.

"While the mutation is not that common in most breeds - outside of greyhounds and other related breeds - because some of these other breeds are so popular, a relatively large number of dogs in this country could be affected." Martinez said.

Michael Court, the study principal investigator and veterinary anaesthesiologist who began studying slow anaesthetic drug breakdown in greyhounds over 20 years ago, said, "Although we have developed special anaesthesia protocols that work very safely in greyhounds - the nagging question was - should we be using these same protocols in other dog breeds?"

Court and Martinez are now moving forward to create a simple cheek swab test that could be used by dog owners and their veterinarians to detect the mutation and determine an individual dog's sensitivity to the problematic anaesthetic drugs.

"We also suspect that dogs with the mutation may have trouble breaking down drugs - other than those used in anaesthesia," Court said. "The challenge now is to provide accurate advice to veterinarians on what drugs and drug dosages should be used in affected patients."



Journal References:

Stephanie E. Martinez, Marie C. Andresen, Zhaohui Zhu, Ioannis Papageorgiou, Michael H. Court. Pharmacogenomics of poor drug metabolism in Greyhounds: Cytochrome P450 (CYP) 2B11 genetic variation, breed distribution, and functional characterization. Scientific Reports, 2020; 10 (1) DOI: 10.1038/s41598-019-56660-z

STAND OUT FROM THE HERD: HOW COWS COMMUNICATE THROUGH THEIR LIVES

Farmers might finally be able to answer the question: How now brown cow?

Research at the University of Sydney has shown that cows maintain individual voices in a variety of emotional situations.

Cows 'talk' to one another and retain individual identity through their lowing.

Studying a herd of 18 Holstein-Friesian heifers over five months, PhD student Alexandra Green from the School of Life and Environmental Sciences determined that the cows gave individual voice cues in a variety of positive and negative situations. This helps them to maintain contact with the herd and express excitement, arousal, engagement or distress.

The study recorded 333 samples of cow vocalisations and analysed them using acoustic analyses programs with assistance from colleagues in France and Italy. The paper was published this month in Scientific Reports.

The conclusion of the research is that farmers should integrate knowledge of individual cow voices into their daily farming practices.

"We found that cattle vocal individuality is relatively stable across different emotionally loaded farming contexts," Ms Green said.

Positive contexts were during oestrus and anticipation of feeding. Negative contexts were when cows were denied feed access and during physical and visual isolation from the rest of the herd.

"We hope that through gaining knowledge of these vocalisations, farmers will be able to tune into the emotional state of their cattle, improving animal welfare," Ms Green said.

She said that by understanding these vocal characteristics,

farmers will be able to recognise individual animals in the herd that might require individual attention.

"Ali's research is truly inspired. It is like she is building a Google translate for cows," said Associate Professor Cameron Clark, Ms Green's academic supervisor.

It was previously known that cattle mothers and offspring could communicate by maintaining individuality in their lowing. Ms Green's research confirms that cows maintain this individual voicing through their lives and across a herd.

"Cows are gregarious, social animals. In one sense it isn't surprising they assert their individual identity throughout their life and not just during mother-calf imprinting," Ms Green said. "But this is the first time we have been able to analyse voice to have conclusive evidence of this trait."

Ms Green travelled to Saint-Etienne, France, to work with some of the best bioacousticians in the world, including co-authors Professor David Reby and Dr Livio Favaro, to analyse the vocal traits of the cattle.

The study will be incorporated into her doctorate, which investigates cattle vocal communication and use in welfare assessment on dairy farms.

Journal References:

Alexandra Green, Cameron Clark, Livio Favaro, Sabrina Lomax, David Reby. Vocal individuality of Holstein-Friesian cattle is maintained across putatively positive and negative farming contexts. *Scientific Reports*, 2019; 9 (1) DOI: 10.1038/s41598-019-54968-4



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Dr Chris Collins, BVSc, has been using 4CYTE™ EPIITALIS® FORTE in both horses and dogs

“ A major advantage of 4CYTE™ EPIITALIS® FORTE over other nutraceuticals is the rapid onset of action, I have generally seen improvement within the first week of using 4CYTE™ EPIITALIS® FORTE.

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Our client feedback about 4CYTE™ EPIITALIS® FORTE is positive and we have many dogs now on this product fulltime. One of my assistants has an older working Kelpie with arthritis and he can now work comfortably by using 4CYTE™ EPIITALIS® FORTE. ”

Dr Chris Collins, BVSc, Piper Street Veterinary Clinic



Belle at 8 years of age, has been able to reduce her injections and hasn't had her pain medication! Owner Krystin expresses her relief that Belle will be able to continue maturing without the discomfort from her joints.

“ As the owner of a dog that at 6 and 8 months of age had both knees operated on, my biggest concern is that I never want her to be in pain. Belle was diagnosed with severe osteoarthritis as a result of her bilateral TPL and meniscus removal surgeries. From 6 months of age Belle was put on several variations of mobility support supplements along with mobility prescription food, monthly anti-inflammatory injections and pain medications to assist her.

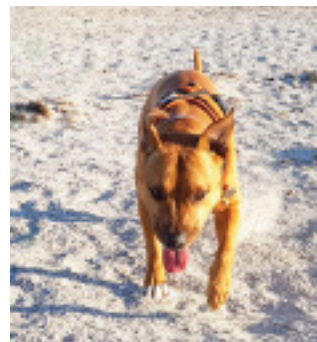
I remember having a beach trip with Belle in which she walked on sand for a prolonged period. She was in that much pain, that she couldn't bare weight on either hind legs, resulting in a trip to the vets for a general anaesthetic and x-rays, which displayed the severity of her arthritis.

Once Belle began 4CYTE™ Granules she showed much more comfort when moving, particularly when she was running around. After a few months, I realised she wasn't sore at all and as a result she was able to switch back to a normal non-prescription diet and gradually stop her medications. When I heard 4CYTE™ EPIITALIS® FORTE was released, I had to get my hands on it straight away.

The biggest sign of improvement was when Belle and I went on the same beach trip whilst on 4CYTE™ EPIITALIS® FORTE. Post beach trip Belle showed zero signs of pain or discomfort, which was such a huge relief for us.

4CYTE™ EPIITALIS® FORTE has proven to us that even dogs suffering from severe joint pain have a real chance to be able to live a pain-free life. And when it's as simple as putting a little bit of gel or granules in their food, there really is no reason not to give it a try. ”

Krystin Pallikaros, Veterinary Nurse, Hobsons Bay Vet Clinic



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CATS' FACES CAN BE HARD TO READ, EXCEPT FOR 'CAT WHISPERERS'

Cats have a reputation for being hard to read, but new research from the University of Guelph has found that some people are veritable "cat whisperers" who excel at deciphering subtle differences in cats' faces that reveal mood.

Women and those with veterinary experience were particularly good at recognising cats' expressions - even those who reported they didn't feel a strong attachment to cats, the large study found.

"The ability to read animals' facial expressions is critical to welfare assessment. Our finding that some people are outstanding at reading these subtle clues suggests it's a skill more people can be trained to do," said Professor Lee Niel, who led the study with Professor Georgia Mason, both from U of G's Campbell Centre for the Study of Animal Welfare.

The only research so far on readings cats' faces has focused on expressions of pain. "This study is the first to look at the assessment of a wider range of negative emotional states in animals, including fear and frustration, as well as positive emotional states," said Mason.

Published recently in the issue of *Animal Welfare*, the study recruited more than 6,300 people from 85 countries who were asked to watch 20 short online videos of cats from a collection of 40 videos, gleaned mostly from YouTube, and complete online questionnaires.

The videos showed cats experiencing either positive emotional states (situations the cats had sought out, such as being petted or given treats), or in negative states (such as experiencing health problems or being in situations that made them retreat or flee).

Each video was focused on the cat's face - its eyes, muzzle and mouth. None of the cats showed expressions of fear, such as bared fangs or flattened ears, since these facial expressions are

already widely understood.

Participants were asked to judge whether each cat was in a positive state, a negative one, or if they weren't sure.

Most participants found the test challenging. Their average score was 12 out of 20 - somewhat above chance. But 13 percent of the participants performed very well, correctly scoring 15 or better - a group the researchers informally called "the cat whisperers."

These people were more likely to be women than men, and more likely to be veterinarians or vet technicians. Younger adults also generally scored better than older adults.

"The fact that women generally scored better than men is consistent with previous research that has shown that women appear to be better at decoding non-verbal displays of emotion, both in humans and dogs," said Mason, who worked on the study along with post-doctoral researchers Jenna Cheal and Lauren Dawson.


Surprisingly, being a cat lover made no difference at all, since reporting a strong attachment to cats did not necessarily result in a higher score.

The finding that some people are skilled at reading cats' faces suggests that others could be trained to do so as well.

"This is important to be able to do because it could help strengthen the bond between owners and cats, and so improve cat care and welfare," said Niel.

Journal References:

LC Dawson, J Cheal, L Niel, G Mason. Humans can identify cats' affective states from subtle facial expressions. *Animal Welfare*, 2019; 28 (4): 519 DOI: 10.7120/09627286.28.4.519



"The ability to read animals' facial expressions is critical to welfare assessment. Our finding that some people are outstanding at reading these subtle clues suggests it's a skill more people can be trained to do."

Professor Lee Niel

LAME SHEEP ADJUST THEIR BEHAVIOUR TO COPE WITH THEIR CONDITION



In the first study of its kind, published recently in the Journal of the Royal Society Open Science, a team of experts from the School of Veterinary Medicine and Science at the University have been able to demonstrate the automated detection of lameness in sheep when standing, lying and walking, using a new prototype tagging and monitoring system.

The technology was developed by Dr Jasmeet Kaler, Associate Professor in Epidemiology and Farm Animal Health from the University, along with industry giant Intel and agricultural software developer Farm Wizard.

Lameness is the biggest health and welfare problem on sheep farms, costing the sector around £80m a year. More than 90% of farmers in the UK report lameness in their flocks, most of which is caused by foot rot - a bacterial infection. If spotted early enough, it can prevent the problem spreading in the flock.

As sheep are a 'prey' species they are likely to mask signs of lameness when they feel threatened, or enlivened by the presence of observing farmers and vets. It means that up to now, diagnosis has been difficult and relies on visual inspection because there are no validated commercial tools available.

The smart wearable technology consists of a sensing device worn on a sheep's ear tag that gathers accelerometer and gyroscope data effectively tracking the animal's behaviour and movement and its way of walking. The algorithms are used to create different alerts for farmers. What is particularly novel about the technology is that it uses edge processing which means it doesn't need to send all the data to the Cloud because it does the thinking on the device, which helps with battery life.

For all three activities (standing, walking and lying), the study has identified features that differed between lame and non-lame sheep. This is particularly novel in lying and standing, which has unobvious lameness related behaviours which it would be difficult to spot with the human eye previously.

The results suggest that instead of affecting how much of an activity lame sheep do, it shows that they actually carry out activities differently, leading to a change in acceleration and rotational movement.

Detecting features that significantly differentiate lame from non-lame was not surprising because of visual differences previously reported between the gait pattern of lame and non-lame sheep. Five out of the top six characteristics when walking, were frequency, linked to rhythm and pace. These differences could be linked to reduced mobility because of the disease in lame sheep, which also resulted in differences in the regularity and frequency of head movements.

Lame sheep also showed a change in gait with peculiar head nodding in line with stride compared to non-lame sheep which had a smoother stride pattern.

A particularly interesting find, was that the results for classification of lameness had a higher accuracy within lying and standing activities.

The top features include a mixture of frequency and time-domain features, this suggests differences in the variability and smoothness of movements for both standing and lying down between lame and non-lame sheep. In lame sheep this could be an attempt by the animal to reduce discomfort caused by the lameness. Where they redistribute their body weight to an unaffected leg leading to postural changes when standing.

The research also suggests that lame sheep possibly lie differently than non-lame ones, this could once again be due to the animal's attempt to alleviate the pain.

Dr Kaler said "Our study has shown conclusively that there are behavioural differences between lame and non-lame sheep when walking, standing and lying. This has been first report of its kind and given lameness classification is possible within all these activities this helps to improve the accuracy as well as flexibility in terms of energy requirements. This automated system for the lameness detection can help improve sheep health and welfare on farms."



Journal References:

Jasmeet Kaler, Jurgen Mitsch, Jorge A. Vázquez-Diosdado, Nicola Bollard, Tania Dottorini, Keith A. Ellis. Automated detection of lameness in sheep using machine learning approaches: novel insights into behavioural differences among lame and non-lame sheep. Royal Society Open Science, 2020; 7 (1): 190824 DOI: 10.1098/rsos.190824

IDENTIFYING FACTORS ASSOCIATED WITH REPORTS OF ACCIDENTAL OPIOID POISONING IN DOGS



Dogs that are smaller, younger, non-neutered, or live in U.S. counties with high opioid prescription rates are at higher risk of being the subjects of phone calls about accidental opioid poisoning to a poison control centre. Mohammad Howard-Azzeh and colleagues at the University of Guelph, Ontario, present these findings in the open-access journal PLOS ONE in January, 2020.

The recent increase in opioid-related deaths among people in the U.S. has raised concerns about related impacts on pet dogs, but few studies have explored potential links. To address these concerns, Howard-Azzeh and colleagues analysed data from 189,594 phone calls made between 2006 and 2014 to the American Society for the Prevention of Cruelty to Animals' Animal Poison Control Centre (APCC). They also evaluated data on opioid prescriptions and opioid-related human deaths from the Centres for Disease Control and Prevention.

The analysis identified several factors associated with higher odds of a dog being the subject of an accidental opioid poisoning call. These included the dog being smaller, younger, non-neutered, or living in a county with a high prescription rate. Calls about opioid poisoning were more likely to be made by a veterinarian than by a member of the public. The overall likelihood of an APCC call being related to opioid poisoning declined significantly from 2008 to 2014.

The researchers suggest possible explanations for how each

of these factors might influence the risk of accidental opioid poisonings in dogs. For instance, perhaps neutered dogs have behavioural changes that make them less vulnerable to accidental poisoning. Or, owners who neuter their dogs may have different drug use habits than those who do not neuter. Further research could help clarify these relationships.

The new findings could increase public awareness of factors that put dogs at risk, potentially helping to lessen further harm. They also suggest that staying knowledgeable of trends in people's use of drugs could aid veterinarians who respond to accidental poisonings.

The authors add "Based on our multi-level statistical analyses, it appears in US counties where there were more opioids prescribed per capita, there were higher odds of dog opioid poisonings being reported to an animal poison control centre compared to other types of poisoning reports. This might suggest a possible "spill-over" effect of human opioid use on pet dogs, but alternative hypotheses concerning pet owner reporting behaviour need to be considered."

Journal References:

Mohammad Howard-Azzeh, David L. Pearl, Terri L. O'Sullivan, Olaf Berke. The identification of risk factors contributing to accidental opioid poisonings in companion dogs using data from a North American poison control center (2006-2014). PLOS ONE, 2020; 15 (1): e0227701 DOI: 10.1371/journal.pone.0227701

VETERINARY SCHOOL SAVED BELOVED PET'S LIFE AND DOG OWNER BUYS \$6 MILLION SUPER BOWL AD FOR THEM

David MacNeil, CEO of a car accessory manufacturer, found out that his golden retriever, Scout, had a tumour on his heart. The 7-year-old dog was diagnosed with cancer in his blood vessel walls and had a 1% chance of survival.

"There he was in this little room, standing in the corner, wagging his tail at me. I'm like, 'I'm not putting that dog down. There's just absolutely no way.'" MacNeil said.

MacNeil took Scout to the University of Wisconsin School of Veterinary Medicine, where the team put him through chemotherapy and radiation to attack his tumour.

Now, that tumour is almost gone.

So, the CEO bought a \$6 million advertisement that aired during the Super Bowl.

The 30-second ad features Scout going through treatment and running through facilities at the car accessory manufacturer's factory. At the end, viewers are shown a link where they can donate to UW's veterinary school.

MacNeil didn't donate money directly to the school, instead he wants viewers to show their support through donations.

Mark Markel, dean of the School of Veterinary Medicine, praised the advertisement.

"This is an amazing opportunity not only for the University of Wisconsin-Madison and the School of Veterinary Medicine, but for veterinary medicine worldwide."



CHECK OUT THE ADVERT ON YOUTUBE!

<https://www.youtube.com/watch?v=Fi2WwRJDii0>

NEW DOG, OLD TRICKS? STRAY DOGS CAN UNDERSTAND HUMAN CUES

If you have a dog, hopefully you're lucky enough to know that they are highly attuned to their owners and can readily understand a wide range of commands and gestures. But are these abilities innate or are they exclusively learned through training?

To find out, a new study in *Frontiers in Psychology* investigated whether untrained stray dogs could understand human pointing gestures.

The study revealed that about 80% of participating dogs successfully followed pointing gestures to a specific location despite having never received prior training. The results suggest that dogs can understand complex gestures by simply watching humans and this could have implications in reducing conflict between stray dogs and humans.

Dogs were domesticated 10,000-15,000 years ago, likely making them the oldest domesticated animals on the planet. Humans then bred dogs with the most desirable and useful traits so that they could function as companions and workers, leading to domesticated dogs that are highly receptive to human commands and gestures.

However, it was not clear whether dogs understand us through training alone, or whether this was innate. Can dogs interpret a signal, such as a gesture, without specific training, or even without having met the signalling person previously? One way to find out is to see whether untrained, stray dogs can interpret and react to human gestures.

Stray dogs are a common feature in cities around the world and particularly in many developing countries. While they may observe and occasionally interact with people, such dogs have never been trained, and are behaviourally "wild." Conflicts between stray dogs and humans are a problem and understanding how humans shape stray dog behaviour may help alleviate this.

To investigate, Dr. Anindita Bhadra of the Indian Institute of Science Education and Research Kolkata, India, and colleagues studied stray dogs across several Indian cities. The researchers approached solitary stray dogs and placed two covered bowls on the ground near them. A researcher then pointed to one of the two

bowls, either momentarily or repeatedly, and recorded whether the dog approached the indicated bowl. They also recorded the perceived emotional state of the dogs during the experiment.

Approximately half of the dogs did not approach either bowl. However, the researchers noticed that these dogs were anxious and may have had bad experiences with humans before. The dogs who approached the bowls were noted as friendlier and less anxious, and approximately 80% correctly followed the pointing signals to one of the bowls, regardless of whether the pointing was momentary or repeated. This suggests that the dogs could indeed decipher complex gestures.

"We thought it was quite amazing that the dogs could follow a gesture as abstract as momentary pointing," explained Bhadra. "This means that they closely observe the human, whom they are meeting for the first time, and they use their understanding of humans to make a decision. This shows their intelligence and adaptability."

The results suggest that dogs may have an innate ability to understand certain human gestures which transcends training. However, it should be noted that the shyer, more anxious animals tended not to participate, so future studies are needed to determine more precisely how an individual dog's personality affects their ability to understand human cues.

Overall, dogs may be more perceptive than we realise. "We need to understand that dogs are intelligent animals that can co-exist with us," said Bhadra "They are quite capable of understanding our body language and we need to give them their space. A little empathy and respect for another species can reduce a lot of conflict."

Journal References:

Debottam Bhattacharjee, Sarab Mandal, Piuli Shit, Mebin George Varghese, Aayushi Vishnoi, Anindita Bhadra. Free-Ranging Dogs Are Capable of Utilizing Complex Human Pointing Cues. *Frontiers in Psychology*, 2020; 10 DOI: 10.3389/fpsyg.2019.02818



ANIMAL-ASSISTED INTERVENTIONS POSITIVE FOR PEOPLE'S HEALTH

The impact of animal-assisted interventions for both patients and health services could be substantial, but more rigorous research is needed, says Dr Elena Ratschen and Professor Trevor Sheldon from the University of York.

Dr Elena Ratschen from the Department of Health Sciences, commenting in an editorial for the BMJ, also says more consideration needs to be given to animal welfare when involving animals of various species in therapeutic activities. The use of virtual reality interventions and robotic pet use should be explored in some contexts.

Healthcare settings such as acute inpatient wards, rehabilitation and psychiatric units, hospices, and dementia care homes open their doors to animals and their handlers every day, aiming to improve patient wellbeing.

Animal-assisted interventions are rapidly expanding in the UK but are largely unregulated. In animal-assisted therapy, a specifically trained animal is incorporated systematically in a treatment plan delivered by a healthcare professional. By contrast, animal-assisted activities are usually led by volunteers and focus more broadly on the presence of an animal, offering opportunities for patients to engage with the animal spontaneously, e.g. during dog visits to hospital ward.

Most animals used in therapy sessions and visits are dogs, although horses, cats, rabbits, guinea pigs and other species can also be found. Many handlers are pet owners volunteering for charities, but some NHS trusts now employ their own therapy teams with highly trained dogs and expert handlers.

Scientific studies have reported promising findings for a range of psychosocial, emotional, and physiological outcomes when animal-assisted interventions have been used. For example, evidence suggests that weekly animal-assisted activities with dogs - such as stroking, playing with, and talking to or about the dog - can have positive effects on the behavioural and psychological symptoms of dementia. However, the scientific evidence related to

animal-assisted interventions in healthcare is overall limited, which poses a potential problem in view of expanding practice.

Dr Ratschen said "The human-animal bond is powerful. Generating robust evidence on how best to harness it could result in substantial gains for patients and health services. Conversely, failure to advance the evidence base is likely to result in waste of scarce resources and poor, potentially unethical, and harmful practice.

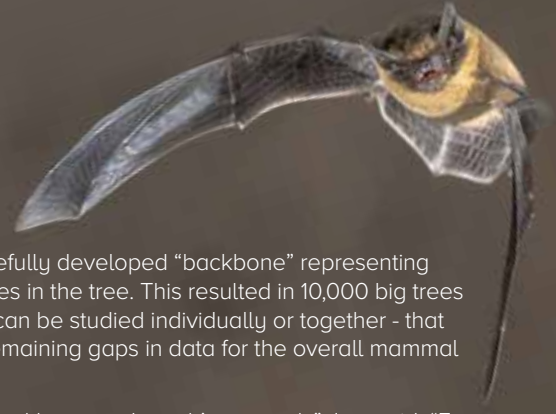
"Animal assisted interventions are inherently complex, involving highly individualised interactions between the recipient, the animal, health and social care professionals, and potentially the handler. These complexities are not fully understood. A more thorough understanding of the conditions within which animal assisted interventions can be provided most safely, effectively, cost effectively, and ethically is needed along with identification of the contexts in which virtual reality or robotic pet interventions offer potential alternatives.

Professor Sheldon added "The suitability of different animal species, how to select individual animals within species for example, based on character traits, and training requirements for different contexts should also be explored, along with optimal monitoring of animal welfare and related risk.

"Although tools to measure or monitor welfare and risk in interventions with dogs are now emerging, further work across species is needed urgently." The University of York, in close collaboration with partner organisations, is working towards developing a national centre for human-animal interactions and health research.



UNTANGLING THE BRANCHES IN THE MAMMAL TREE OF LIFE



The mammal tree of life is a real leaner. Some branches are weighed down with thousands of species - we're looking at you, rodents and bats - while others hold just a few species.

Now we may have a better idea why.

In a new study published in the journal PLOS Biology, researchers at Yale University unveil a complete overhaul of the way species data is brought together and analyzed to construct an evolutionary tree of life for mammals. It's aimed at giving scientists, conservation managers, policymakers, and environmentalists more accurate, comprehensive information about species diversity and relationships, past and present.

"The fossil and genomic data we use are often fragmentary and messy, but the reality is we are reconstructing events that occurred millions of years ago in long-extinct mammals," said Nathan Upham, a Yale postdoctoral associate in ecology and evolutionary biology and first author of the study.

Of the roughly 6,000 species of living mammals, most of them are rodents (42%) or bats (24%), while common mammals such as cows, pigs, sheep, cats, raccoons, and monkeys consist of relatively few species. Yet up to this point, attempts to formulate a tree of life for mammals have been unable to explain this unevenness of species diversity.

Upham and senior author Walter Jetz, professor of ecology and evolutionary biology at Yale, took a new approach. They reconstructed the evolutionary relationships of species by creating "patches" of smaller, more accurate evolutionary trees that were

then linked to a carefully developed "backbone" representing the deep divergences in the tree. This resulted in 10,000 big trees - designed so they can be studied individually or together - that also point out the remaining gaps in data for the overall mammal tree of life.

"We're calling it a 'backbone-and-patch' approach," Jetz said. "For the first time, we're able to characterise the genetic relationships of essentially all living mammals while transparently relaying the parts that remain uncertain. It should enable advances in a variety of fields, including comparative biology, ecology, and conservation."

The completeness and accuracy of this information is important, Jetz added, as evolutionary distinctiveness is increasingly used to determine conservation priorities. Therefore, it can be useful for researchers and policymakers in the U.S. to know that the closest genetic relatives of the pronghorn antelope in the U.S. are not nearby mammal species, but giraffes and okapi in Africa.

The researchers also developed an interactive tool for exploring the mammal tree of life. The interface, which is downloadable, lets users examine information both at the species level and also more broadly.

Upham said further research will use the new information to look at how the uneven distribution of species in the mammal tree of life is related to geographic isolation among mammal populations, which can lead to higher rates of speciation - the evolutionary process of forming new species - and extinction.

Journal References:

Nathan S. Upham, Jacob A. Esselstyn, Walter Jetz. Inferring the mammal tree: Species-level sets of phylogenies for questions in ecology, evolution, and conservation. PLOS Biology, 2019; 17 (12): e3000494 DOI: 10.1371/journal.pbio.3000494

THE EVERLASTING CALYPSO

Most Australian pony clubs 40 plus years ago, would have had at least one Calypso or Clippy for short in the club. The adoring name had not only given plenty of joy; but went onto teach kids how to ride.

So when Calypso, the much loved 50 year old quarter horse gelding passed away it had outlived twice as long as the average horse. Calypso died on the Gold Coast and was thought to be the oldest horse in Australia when he celebrated the milestone with a birthday party in the Tallebudgera Valley on the official horses' birthday, August 1, last year.

Calypso was a quarter horse which are renowned for being tough and right to the last day he was lively, eating and happy..

Calypso was almost completely blind and deaf in his final years and although in need of glasses and hearing aid children would often visit him in his paddock. He had a strong social media following and was well loved.

Calypso's longevity surprised equine veterinarian Dr. Rhian Partridge when the gelding turned 50 last year, which she said was like 150 in human years.

"Just like with people, Calypso's obviously got good genes...been

well cared for throughout his lifetime and I would probably say that it is very fortunate that he has held onto his teeth for quite a long time."



THROUGH THE EYES OF ANIMALS

Humans are now closer to seeing through the eyes of animals, thanks to an innovative software framework developed by researchers from the University of Queensland and the University of Exeter. PhD candidate Cedric van den Berg from UQ's School of Biological Sciences said that, until now, it has been difficult to understand how animals really saw the world.

“Most animals have completely different visual systems to humans, so - for many species - it is unclear how they see complex visual information or colour patterns in nature, and how this drives their behaviour,” he said.

“The Quantitative Colour Pattern Analysis (QCPA) framework is a collection of innovative digital image processing techniques and analytical tools designed to solve this problem.

“Collectively, these tools greatly improve our ability to analyse complex visual information through the eyes of animals.”

Dr Jolyon Troscianko the study's co-leader from the University of Exeter said colour patterns have been key to understanding many fundamental evolutionary problems, such as how animals signal to each other or hide from predators.

“We have known for many years that understanding animal vision and signalling depends on combining colour and pattern information, but the available techniques were near impossible to implement without some key advances we developed for this framework.”

The framework's use of digital photos means it can be used in almost any habitat - even underwater - using anything from off-the-shelf cameras to sophisticated full-spectrum imaging systems.

“You can even access most of its capabilities by using a cheap (~\$110 AUD, £60 GBP, \$80 USD) smartphone to capture photos,” Dr Troscianko said.

It took four years to develop and test the technology, which included the development of an extensive interactive online platform to provide researchers, teachers and students with user-guides, tutorials and worked examples of how to use the tools.

UQ's Dr Karen Cheney said the framework can be applied to a wide range of environmental conditions and visual systems.

“The flexibility of the framework allows researchers to investigate the colour patterns and natural surroundings of a wide range of organisms, such as insects, birds, fish and flowering plants,” she said. “For example, we can now truly understand the impacts of coral bleaching for camouflaged reef creatures in a new and informative way.”

“We're helping people - wherever they are- to cross the boundaries between human and animal visual perception.”

“It's really a platform that anyone can build on, so we're keen to see what future breakthroughs are ahead.”

Journal References:

Cedric P. Berg, Jolyon Troscianko, John A. Endler, N. Justin Marshall, Karen L. Cheney. Quantitative Colour Pattern Analysis (QCPA): A comprehensive framework for the analysis of colour patterns in nature. *Methods in Ecology and Evolution*, 2019; DOI: 10.1111/2041-210X.13328



'INVISIBLE,' RESTRICTED HORSE RACING THERAPY MAY LEAVE A TRAIL

A treatment called extracorporeal shockwave therapy (ESWT) is used in patients both human and equine to speed healing of injured tendons and ligaments. Using high-pressure sonic waves, ESWT is thought to increase blood flow to the treated area and has been shown to reduce pain over the short term.

In racehorses, however, masking pain can come with a cost: Overworked minor injuries could lead to major ones or even pose a life-threatening risk to both horse and rider.

For that reason, horse racing authorities have banned the use of ESWT for horses within 10 days of a race or sporting event. But the question of how to enforce this "invisible" therapy remained open. Now a team led by Mary Robinson, director of the School of Veterinary Medicine's Equine Pharmacology Research Laboratory, and lab member Jinwen Chen has found that the practice does in fact leave a trail. In a paper in *Equine Veterinary Journal*, they report finding potential biomarkers of ESWT that, with further testing, could one day be used to enforce the ESWT ban.

"Because it's not a drug - it's applied to the surface of the skin - it's just not an easy thing to detect," says Robinson. "After a lot of trial and error, our study was able to measure changes in levels of five inflammatory factors, some of which we could detect up to three weeks after the shockwave therapy."

The attempt to find these biomarkers dates back roughly a decade.

"It was Dr. Lawrence Soma, my predecessor, who said the lab was going to have to look at blood-based or urine-based biomarkers to try to detect shockwave therapy," Robinson notes.

To find the fingerprints that ESWT might leave behind, the researchers tested the therapy on 11 horses kept as a study herd at Penn Vet's New Bolton Centre. The researchers collected blood samples from the group of horses, composed of Thoroughbreds and Standardbreds, at several times both before and after each received a single dose of ESWT to a leg.

Over the years, the lab investigated a number of potential biomarkers, molecules that would indicate a horse received ESWT. They zeroed in on 10 pro-inflammatory and anti-inflammatory signalling molecules, called cytokines, which they can measure from the blood using a sensitive test called ELISA, short for enzyme-linked immunosorbent assay.

"We looked a week before giving the shockwave therapy to see if there were any changes in the baseline period, due to changes in time of day or anything else, and didn't see anything we could define as significant," Robinson says. "And in the post-shockwave period we went out to three weeks."

They could not detect changes in five of the cytokines they examined following ESWT. But the other five - TNF- α , IL1 β , IL-1RA, IL-6, and sTLR2 - did respond. Of those, TNF- α levels were significantly increased through the whole of the post-therapy study period, three weeks.

More study is necessary, Robinson emphasises, before these biomarkers could be used to assess inappropriate use of ESWT in racehorses. For one, the researchers would like to see if measuring these same molecules in horses that are actively training and racing or that have an acute injury might change their results.

For that, she and her colleagues are actively pursuing follow-up studies to look at these biomarkers and other indicators using a biobank of samples from client-owned animals, including injured and active racehorses, treated at New Bolton Centre.

The end goal is to keep the sport safe.

"Shockwave therapy is great as long as people rest the horse after using it," she says. "We are concerned that it's being abused in the racehorse industry and that it could potentially result in breakdowns. That's exactly what we're trying to avoid."

Journal References:

J.-W. Chen, D. Stefanovski, J. Haughan, Z. Jiang, R. Boston, L. R. Soma, M. A. Robinson. Inflammatory mediators are potential biomarkers for extracorporeal shockwave therapy in horses. *Equine Veterinary Journal*, 2019; DOI: 10.1111/evj.13183



THE ABCS OF VETERINARY DENTISTRY: B IS FOR BURS AND ‘BUNNY RABBITS’ INCISOR TEETH PROBLEMS

DR DAVID E CLARKE REGISTERED SPECIALIST, VETERINARY DENTISTRY AND ORAL SURGERY

IN OUR PREVIOUS ARTICLE WE STARTED OUR ALPHABETIC JOURNEY LOOKING AT OUR VETERINARY PATIENTS’ ORAL PROBLEMS BEGINNING WITH AN ‘A’, WHICH INCLUDED ANAESTHESIA MONITORING, ATTRITION AND ABRASION. I INVITE YOU TO CONTINUE THE JOURNEY THROUGH THE ALPHABET ON OUR QUEST TO DO THE BEST DENTISTRY FOR OUR VETERINARY PATIENTS AND LOOK AT ‘B’ FOR BURS AND BUNNY RABBITS.

BURS

Dental burs are small rotary instruments with cutting blades used in an operative head, such as a high-speed or slow-speed contra-angle handpiece.

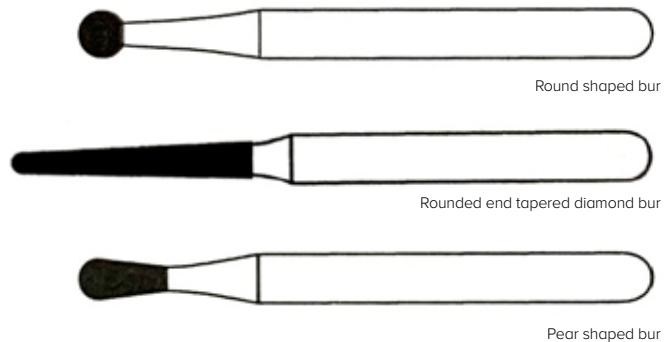
Dental burs are used for excavation of dental tissues, cutting/sectioning teeth prior to extraction, bone removal, crown preparation, shaping and finishing restorations and gingivoplasty. Although carbon steel burs are available, the most common materials used to manufacture veterinary dental burs are tungsten carbide and diamond. Tungsten carbide hold up well to cutting enamel, are cost effective and maintain their sharpness, compared to diamonds which are more expensive and quickly dull. A tungsten carbide bur is ideal for cutting/sectioning teeth prior to extraction and bone removal, whereas a diamond is better for excavation of dental tissues, crown preparation, shaping and finishing restorations and gingivoplasty. A white stone can also be used for shaping and finishing restorations.

The choice of burs can be overwhelming on initial inspection, as there are literally thousands of different burs when one opens a human dental catalogue. There are hundreds of shapes, sizes and diamond grades available to select for each procedure. To make life easier, they can be classified into a few basic shapes and shank types, but it is up to the individual to find what works for them. The most common burs I use are:

Shape	Size	Use
Round	½, 1, 2, 4, 6	Cavity preparation and under cuts for restoratives
Tapered Fissure - crosscut	699, 700, 701L	Tooth sectioning and bone removal
Pear	330 - 333	Endodontic access
Tapered diamond round end	850, 856 fine grit	Crown preparation, cavity preparation, cutting inclines in orthodontic appliances, gingivoplasty, composite finishing
White stone bur		Composite finishing

The shank types are dependent on the handpiece they are used in. There are three shank types: friction grip (FG), contra angle (CA) and (HP) handpiece. A friction grip bur is 1.6mm diameter, available in standard or longer surgical length, and used in a high speed handpiece. The majority of procedures can be managed well with the standard length, but a large carnassial tooth extraction will benefit from the extra surgery length bur. All bur shapes are available in friction grip. The advantage a friction grip bur provides

is the speed of 400,000 rpm and water-cooling of the high speed handpiece. The contra-angle bur is 2.35mm diameter and used in a slow speed handpiece, which operates at 1,000 - 20,000 rpm. These are ideal for dentine or bone recontouring, but often the veterinary handpiece does not have water-cooling, so care must be taken. The end of the CA bur has a flat section which locks it



BUNNY RABBITS AND THEIR INCISOR TEETH PROBLEMS

Bunnies have a different oral and dental anatomical and physiological make up compared to dogs and cats. They also have a high incidence of oral problems that can be treated and managed by the veterinary surgeon.

Oral examination

Bunnies have small mouth openings, so a complete examination in a conscious animal can be difficult. Palpate the ventral mandibular borders, the mandibular rami and the maxillary arches for swellings, pain, inflammation, tenderness and discomfort. Next check the incisor teeth for conformation, malocclusions and normal length. Then try to examine the premolar and molar teeth. Using an otoscope can give you an idea of what is happening in the caudal oral cavity.

Dental Anatomy

Bunnies do not have canine teeth and their incisor, premolar and molar teeth are continuously growing. They are termed aradicular hypsodont, meaning no true root structure and continuously growing. The permanent dental formula is $2 \times (I \ 2/1, C \ 0/0, P \ 3/2, M \ 3/3) = 28$ teeth in total.

Bunnies have two rows of incisor teeth in the maxilla, comprising 4 maxillary incisors in total. In the front row there are two large incisor teeth and positioned palatal to these are two smaller incisor teeth (or peg teeth). There are two mandibular incisors. The cusps of the mandibular incisor teeth are positioned and occlude between the large and peg incisor teeth.



Normal bunny incisor occlusion. Note the two maxillary incisor teeth and two mandibular incisor teeth. The smaller maxillary incisor 'peg' teeth are hidden behind the large incisors.

into the handpiece. The handpiece, or HP bur, is 2.35mm diameter and used in a straight nose cone handpiece. These are ideal for bunny dentistry for shortening overgrown premolar and molar teeth or in the laboratory. They operate at 100 - 20,000 rpm, generally without water-cooling.



The bunny has three premolar and three molar teeth in the maxilla and two premolar and three molar teeth in the mandible bilaterally. Enamel is much thicker on the mesial (front) surface of the incisors and on the buccal (lateral) surfaces of the premolar and molar teeth, essentially forming a cutting blade. When the bunny's mouth is at rest, it is held in the midpoint of its forwards - backwards movement. The cutting surface of the premolar and molar teeth do not occlude at rest. In order to eat, the bunny must bite off food into small pieces, which is performed by the incisor teeth. The sharp edges of the mandibular incisor teeth are drawn across the occlusal surfaces of the maxillary incisors in a slicing action. This action, due to the enamel edge acting as a blade, maintains the length of the incisor teeth, as the sharp enamel edge abrades the tooth and shortens it.



A bunny skull showing the position of the teeth and relationship of the occlusion.

Both the premolar and molar teeth are maintained by the lateral chewing action, which brings the edges of the occlusal surfaces into contact. The left side mandibular and maxillary teeth work together, whilst the right side work together. During normal mastication, the bunny chews on both sides of its mouth. As the bunny chews the lingual edge of the mandibular premolar and molar teeth contacts the buccal edges of the maxillary premolar and molar teeth. The teeth are then moved across each other to the point where the palatal edge of the maxillary premolar and molar teeth contacts the buccal edge of the mandibular teeth. This action is repeated twice a second, depending on the type and nature of the food. If the bunny eats commercially available food, such as pellets, the jaw movements are significantly shortened and the action produces less contact of the teeth, which in turn results in wear of the lingual side of the maxillary teeth and the buccal surface of the mandibular teeth. In turn this produces spurs and hooks on the buccal surface of the maxillary teeth and the lingual surface of the mandibular teeth.

SIGNS OF DENTAL DISEASE

Common clinical signs associated with dental disease:

- Decreased food intake
- Weight loss
- Poor coat condition
- Change in defecation
- Salivation, wet dewlap
- Ocular and nasal discharge
- Mandibular swelling
- Difficulty closing the mouth
- Elongated incisor teeth
- Facial swelling
- Systemic disease
- Death

INCISOR MALOCCLUSIONS

Primary incisor malocclusion

Primary malocclusions occur in bunnies under 12 months of age. Bunnies as young as three weeks of age may show brachygnathism of genetic origin resulting in a malocclusion and overgrowth of the mandible. An autosomal recessive gene for a shortened maxillary diastema is the probable cause. It is commonly seen in dwarf bunnies. This causes a longer mandible and an incisor malocclusion. The incisors continue to grow and with no attrition or wear, the maxillary incisors tend to curl and twist in the oral cavity, and the mandibular incisors grow laterally, appearing similar to an elephant or pig tusk. This often results in an inability of the bunny to eat and prehend food so they slowly lose body condition, slobber, drop food from the mouth and suffer moist dermatitis of the skin around the mouth and on the chest.

In bunnies with continuously growing premolar and molar teeth, incisor malocclusions may lead to secondary premolar and molar issues. When the incisors are unable to section food into bite size pieces, the bunny does not chew on the premolar and molar teeth properly and therefore they do not wear adequately. The overgrowth of these teeth force the mouth open and present the previously described clinical signs. If the maxillary premolar and molar teeth overgrow, they grow laterally, lacerating the buccal mucosa, whilst the mandibular premolar and molar teeth grow lingually, entrapping the tongue.

Secondary incisor malocclusion

Secondary incisor malocclusion occurs in older bunnies, usually over 12 months of age. This is more commonly diagnosed than primary incisor malocclusions. Secondary malocclusion may result from lack of attrition and wear of both the incisor teeth or the premolar and molar teeth. This may be due to general illness, lack of chewing, a change of diet, oral infections, temporomandibular joint dysplasia or tooth fractures.

The first step in treatment of incisor malocclusion is to determine whether you have a primary or a secondary incisor malocclusion.

Diagnosis

In the consulting room in the awake bunny, a general intra-oral examination can be performed using an otoscope. If the 5mm diameter scope is used, the height of the premolar and molar teeth can be estimated quite easily. On oral examination, in the bunny, the teeth should have a flat occlusal surface. The maxillary premolar and molar teeth are almost level with the gingiva and the mandibular premolar and molar teeth should be 1-2mm above the gingiva. Once overgrowth occurs, the teeth become longer, the maxillary premolar and molar teeth grow laterally, flare buccally, produce spurs and hooks and ulcerate the mucosa, whereas the mandibular premolar and molar teeth grow lingually over the tongue. A complete examination though must be performed under general anaesthesia.



An oral examination using gauze and a cheek pouch dilator allows visualisation of the overgrown right sided mandibular premolar and molar teeth.

Treatment of dental problems

The primary role of treatment is to remove the malocclusion, provide occlusal adjustment (odontoplasty), extract affected teeth and complete abscess debridement.

Odontoplasty

Trimming of the incisors with nail clippers designed for cutting dogs' toe nails should be avoided to prevent fracturing the tooth and exposing the pulp. A high speed diamond bur can be used to reduce the tooth height. The correct angle of occlusion should be maintained. To protect the surrounding soft tissues, a tongue depressor can be placed behind the incisor to protect the tongue.

If the incisor tooth fractures during trimming or the height is reduced too severely, the pulp may be inadvertently exposed. The pulp should be treated by direct pulp capping immediately the pulp is exposed. Approximately 2mm of coronal pulp is removed with a # 1 round diamond bur in a water cooled high speed handpiece. Haemorrhage is controlled with a sterile paper point, followed by sealing of the pulp, which requires placement calcium hydroxide cement followed by an intermediate restorative material. The opposing teeth may need to be trimmed. The hard setting composites should not be used as they do not wear like a normal tooth.

Extractions

An alternative to tooth trimming is extraction. Specialised instruments are required to perform extraction cleanly. A luxator, curved root elevator, molar extraction forceps, Crossley luxators, Molt #2 (EX-9) periosteal elevator are a good start. A closed technique can be used to extract the incisor teeth. A Crossley luxator and Molt #2 (EX-9) elevator can be used. The portion of the tooth located subgingivally is exceptionally long in both the maxillary and mandibular incisor teeth. The maxillary incisor has a tight curve on the subgingival portion of the tooth, similar to a circle with a 5cm diameter, whereas the mandibular tooth has a milder curve, similar to a circle with a 10cm diameter.

The first step is to sever the epithelial attachment using a Molt #2/#4 periosteal elevator or a #11 scalpel blade. The blade is inserted into the gingival sulcus and the attachment is severed from the underlying alveolar bone ridge from around the entire circumference of the tooth. The instrument is inserted into the space between the tooth and the bone occupied by the periodontal ligament.



A Crossley incisor elevator.



A Molt #2 (Cislak EX-9) periosteal elevator.

A curved deciduous tooth elevator can be used on the rostral and palatal/lingual surfaces, whereas the Molt #2/#4 or Crossley can be used on the buccal or mesial surfaces. After the instrument is placed, a slight twisting motion parallel to the tooth is used to break down the periodontal ligament. The elevator is slowly advanced apically and around the circumference of the tooth. Once loose the tooth can be grasped with molar extraction forceps and removed.



A curved deciduous elevator.

The use of early traction, leverage or torque in excess of what is needed, may break the tooth. If the tooth breaks, the remains should be removed. If left, the tooth will regrow and you will have another opportunity to remove it. Once the tooth is removed, the socket should be flushed and curetted of debris and granulation tissue, and any bony spicules smoothed. The sulcus is closed by suturing the gingiva with an absorbable suture.



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FEMALE FISH CAN BREED A NEW SPECIES IF THEY AREN'T CHOOSY ABOUT WHO IS MR. RIGHT



Fish will mate with a species outside their own if the male's colouring is attractive enough or if the female can't see him properly, according to new research.

Such 'mistakes' in mate choice can lead to the evolution of new species, an international team of scientists found. The group studied 2000 fish and analysed the DNA of more than 400 cichlid fish from two freshwater lakes in East Africa. They discovered more than 40 new species in Lake Mweru, which formed around one million years ago.

Dr Joana Meier, an evolutionary biologist at St John's College, University of Cambridge, and lead author of the research published in December in *Nature Communications*, said "We found a dazzling variety of ecologically diverse new species - called radiations - that were previously unknown.

"The new species of cichlids adapted to use all the available food resources in the lake. Some feed on insect larvae, others zooplankton or algae. Some newly discovered fish are predators with large teeth, which we named 'large-tooth serranchromines'."

Many people assume fish are all the same species because they all live in water. But there are 30,000 different species of fish and many of them are markedly different from each other. Expecting them to mate outside of their own species is like expecting a horse to mate with a cat because they both have four legs and a tail.

Fossil records show fish have existed for more than 500 million years which makes them very old on the evolutionary scale. There are more than 1300 species of cichlids and many are popular aquarium fish. They are primarily freshwater fish and the majority of species are African, appearing in great diversity in the major African lakes where this 10-year study took place.

Female cichlid fish choose their partner and in mating ritual tests in the lab, the team of international scientists discovered that under

certain circumstances the females would choose a male from different species that had similar colouring to males from their own species. They also found that when the light conditions are poor, the females could not distinguish between males of their own species or from other species because they could not see their colours properly.

This is what they determined happened a million years ago when the different species of fish mixed together when Lake Mweru was formed, sparking the evolution of 40 new species of fish.

Dr Meier explained "To diversify into different species, the cichlid fish needed the ecological opportunity provided by the new habitats of Lake Mweru, formed one million years ago, which is still considered to be recent in evolutionary terms! That more than 40 species utilising different food resources and habitats could evolve so rapidly is highly unusual.

"When Lake Mweru was formed it combined cichlid lineages from the Congo and the Zambezi. The cichlids from these different drainage systems then mated with each other. This could have been because when the lake formed, the water was very cloudy and they couldn't see colours properly so the females were not being as choosy about selecting a mate in their new environment. Mating between cichlids from different drainage systems produced very diverse offspring combining the genetic traits of both parental species."

The so-called 'hybrid offspring' can feed on different things to their parents and invade new habitats - like swimming into deeper areas of the lake. It is unclear whether all of the species will survive as they may compete with each other and die out.

Dr Meier said "Our research shows that hybridisation can fuel the evolution of new species which is a very novel finding. Hybridisation has traditionally been viewed as something bad because if species hybridise they can, over time, merge into a single species and you lose biodiversity or lose the local species.

The melting pot of Lake Mweru gave us a rare opportunity to study interactions between evolving new species and showed that in a new environment with lots of ecological opportunity hybridisation can be a good thing that actually increases biodiversity."



Journal References:

Joana I. Meier, Rike B. Stelkens, Domino A. Joyce, Salome Mwaika, Numel Phiri, Ulrich K. Schliewen, Oliver M. Setz, Catherine E. Wagner, Cyprian Katongo, Ole Seehausen. The coincidence of ecological opportunity with hybridization explains rapid adaptive radiation in Lake Mweru cichlid fishes. *Nature Communications*, 2019; 10 (1) DOI: 10.1038/s41467-019-13278-z

DOLPHINS GATHER IN FEMALE FAMILY GROUPS

Social clusters including mothers' groups play an important role in the life of southern Australian bottlenose dolphins, a new study shows.

Like giraffes, lions, hyenas and grey kangaroos, bottlenose dolphins appear to form social bonds with kin and other females in similar reproductive condition, while maintaining moderate and loose social bonds with some same-sex individuals.

A study at a popular holiday destination in South Australia found female bottlenose dolphins (*Tursiops cf. australis*) raise young in select group and local bays, further highlighting the need for more protection from marine sanctuary and controls on aquaculture and fishing.

Marine biologist Dr Fernando Diaz-Aguirre, who studies and photographs marine wildlife, has supported long-term observations of bottlenose dolphins in the Coffin Bay region of SA's Eyre Peninsula.

Just like in human communities, he says the dolphins tend to form family groups, with those females most closely related genetically forming close social relationships in specific areas of the large open Coffin Bay.

"These close social groups among related females appear to be vital for them while raising young calves, or for those without calves who also combine due to similar biological requirements related to feeding and mating," Dr Diaz-Aguirre says.

"As well as key pointers on social evolution and behaviour in these highly complex marine mammals, our study also provides important information for the conservation of the Coffin Bay population."

Depending on kinship and other ties, specific females and their

young either live in Kellidie Bay, Mt Dutton or near Port Douglas - giving key clues for reducing anthropogenic threats such as boat strikes, entanglement in fishing gear, or habitat displacement due to aquaculture and pollution.

Dr Diaz-Aguirre is lead author of the latest study, published this month in *Scientific Reports*, with Flinders University Cetacean Ecology, Behaviour and Evolution Lab (CEBEL) researchers.

Senior author, dolphin and whale expert Flinders University Associate Professor Luciana Möller, says the study sheds light on how dolphin societies are developed and maintained, including special adaptations such as hunting skills, and how social learning is passed from one generations to the next.

"Our field studies are not only important for understanding the evolution of complex animal societies, but for providing information to conservation managers to sure the future survival of these unique dolphin populations," Associate Professor Möller says.

"Small resident populations of dolphins, as the one in Coffin Bay, are particularly vulnerable to changes in the environment, and represent sentinels of the health of coastal ecosystems."

Journal References:

F Diaz-Aguirre, GJ Parra, C Passadore and L Möller. Kinship and reproductive condition correlate with affiliation patterns in female Southern Australian Bottlenose Dolphins, 2020; DOI: 10.1038/s41598-020-58800-2

Southern Australian bottlenose dolphin and newborn calf. Photo credit: Dr Fernando Diaz-Aguirre



BSAVA BECOMES EDUCATIONAL PARTNER OF WSAVA

The British Small Animal Veterinary Association (BSAVA) has become an Educational Partner of the World Small Animal Veterinary Association (WSAVA), following the two associations' long-standing collaboration in supporting veterinary continuing education (CE) in Africa. As Educational Partners, the WSAVA and the BSAVA plan to work together on projects to increase the accessibility of digital learning to companion animal veterinarians globally, particularly in regions of the world where companion animal practice is still developing and resources are limited.

The WSAVA represents more than 200,000 veterinarians worldwide through its 113 member associations, including the BSAVA. Its core activities include the development of WSAVA Global Guidelines in key areas of veterinary practice, such as pain management, nutrition and vaccination, and the provision of continuing education.

The BSAVA is a not-for-profit professional body founded in 1957. It promotes excellence in small animal practice through education and science and has more than 10,000 members, with the majority working in practice as veterinary surgeons or veterinary nurses. The BSAVA has supported WSAVA CE initiatives in Sub-Saharan Africa since 2008. During this time, more than 70 courses have taken place in 14 African countries, led by expert speakers.

More recently the BSAVA has supported a program run by the WSAVA's charitable Foundation through its African Small Companion Animal Network (AFSCAN) initiative. AFSCAN is working to advance standards of veterinary care across Africa through education and through facilitating the creation

of a sustainable network of companion animal veterinarians, associations and specialist groups. It has recently launched an innovative clinic-to-clinic twinning program that connects selected clinics in AFSCAN member countries in Africa with clinics in the US, led by American Veterinary Medical Association (AVMA) members.

The BSAVA also offers free access to educational resources from its online library to vets in countries with limited resources through its 'Foundation Collection' in a partnership with the WSAVA, the WSAVA Foundation and the Federation of Companion Animal Veterinary Associations (FECAVA).

Welcoming BSAVA as an Educational Partner, WSAVA President Dr Shane Ryan said "Providing continuing education opportunities for our colleagues in areas where access may be difficult, cost-prohibitive or simply unavailable is fundamental to improving veterinary standards. We thank the BSAVA for its past support, and as we move into a new relationship as Educational Partners, we are eager to continue working together to increase the effectiveness and reach of the CE we provide to veterinarians around the world."

Dr Krista Arnold, Chair of BSAVA's International Committee, said: "The BSAVA is proud to join WSAVA as an Educational Partner and to make our learning resources accessible to those who may otherwise have limited access to continued education. We are also exploring other ways of working together to support the health and welfare of companion animals through improved veterinary care."



WSAVA continuing education event in Madagascar in 2019, which was supported by BSAVA

GLOBAL DATABASE OF ALL BIRD SPECIES SHOWS HOW BODY SHAPE PREDICTS LIFESTYLE

A database of 10,000 bird species shows how measurements of wings, beaks and tails can predict a species' role in an ecosystem.

Given that many bird species perform important ecological functions, such as pollinating plants, spreading seeds, or controlling pests, the database may help scientists to understand and predict how the loss of species will affect ecosystem health.

A global team of researchers, led by Imperial College London and University College London, visited museums around the world to find specimens of nearly 10,000 species, covering more than 99 percent of all known bird species. Their results, and the database, are published recently in *Nature Ecology and Evolution*.

The link between body form of each animal species and aspects of their lifestyle, including diet, has previously been proposed, but this is the first time it has been confirmed at such a large scale and with such precise detail.

The senior author of the study, Dr Joseph Tobias, from the Department of Life Sciences at Imperial, said "To compile measurements for all bird species has been a massive undertaking. That's particularly the case considering the hundreds of explorers and biologists over the last 150 years who collected and curated the 70,000 museum specimens on which this work is based."

Predictions of a species' contribution to an ecosystem are often made using estimates of their evolutionary relationships with other species - relying on the fact that closely related species tend to be more similar in function than distantly related species.

However, the new database shows that body measurements offer a far better prediction overall, as some very distantly related species have evolved similar bodies to equip them for similar lifestyles or dietary preferences.

For example, the family of auks, which includes puffins and guillemots, have very similar body shape to penguins, despite

evolving in opposite hemispheres. Both have beaks, bodies and wings adapted to swimming and catching fish underwater.

The concept - called convergent evolution - is far from new, but the new dataset provides the clearest picture yet of its widespread influence across an entire class of animals at a global scale.

The team looked at nine body measurements including the dimensions of beaks, tails, wings and legs as well as body mass, and compared these to a bird's diet and foraging behaviour - for example whether it primarily catches invertebrates in the air, on the ground, or under water.

Some associations are obvious, such as longer wings in species that spend much of their time flying, or longer legs in ground-dwelling species. However, the team found that the combination of all body measurements was highly predictive of even subtle differences in lifestyle, and ecosystem function, across all species.

The study's first author, Dr Alex Pigot of UCL's Department of Genetics, Evolution & Environment, said: "Our results suggest that evolution is a predictable process. If we were to 're-run the tape of life', then evolution likely would once again lead to very similar-looking organisms to the ones we see today.

"Being able to quantify each animal's vital role in the functioning of the biosphere is really important in understanding impacts of the current extinction and climate crisis."

Dr Tobias said "The link we show between body form and function has some potentially important applications, and paves the way for the use of similar data to investigate the role of biodiversity in ecosystems.

"For example, further studies can use our database to predict the effects of climate and land-use change on ecosystem function, and to set appropriate targets for wildlife conservation."



Journal References:

Alex L. Pigot, Catherine Sheard, Eliot T. Miller, Tom P. Bregman, Benjamin G. Freeman, Uri Roll, Nathalie Seddon, Christopher H. Trisos, Brian C. Weeks, Joseph A. Tobias. Macroevolutionary convergence connects morphological form to ecological function in birds. *Nature Ecology & Evolution*, 2020; DOI: 10.1038/s41559-019-1070-4

MALE SONGBIRDS CAN'T SURVIVE ON GOOD LOOKS ALONE

Brightly coloured male songbirds not only have to attract the female's eye, but also make sure their sperm can last the distance, according to new research.

In the study, published recently in the Royal Society journal *Biology Letters*, a team of scientists led by Dr Kate Durrant from the School of Life Sciences at the University of Nottingham, looked at how evolution shapes the plumage and the sperm cells of songbird species so that they mate successfully and pass on their genes.

Previous studies have focussed on a bird's appearance alone, but this is the first study that has looked at this together with the shape of the sperm, to understand if intense competition shapes both plumage (to compete before mating) and the sperm (to compete after mating).

The team looked at 278 species of song bird from around the world and a combination of data on their plumage and the shape of their sperm, to see how they have evolved to ensure successful mating.

The eye-catching plumage of some male songbirds has long been explained as a result of sexual selection: brighter males compete more successfully for mates, and leave more offspring, so evolution favours them. Female birds, by contrast, remain drab, because for them it is more important to be camouflaged on the nest.

How much competition for mates a male song bird faces varies between species, and depends on factors such as the number of available females, how dense the population is, and other things such as the structure of the vegetation they are in.

Dr Durrant said "The intensity of sexual selection varies between species. If mate competition is really strong, not only are males really colourful and attractive, but they also need to have the best sperm too if they are going to compete."

The 'midpiece' in the bird's sperm produces energy-containing molecules, called ATP, to power movement. Previously, experts thought that if the sperm had a large midpiece, it produced a lot of ATP, and the sperm 'swam' really quickly and got to the egg first. Whilst this is true in some species, it is not always the case and it is more likely that a large midpiece allows the sperm to last longer, rather than swim faster.

Data on plumage from previous studies were used, together with data on the shape of sperm, for 278 species of song birds. The team found that males from species with more elaborate and colourful plumage, had longer sperm midpieces, which allows the sperm to last for a long time after the male mates with the female, who then stores it for when she is ready to release an egg.

"In a really competitive environment, lots of males are competing with each other for the female's attention, and there can be a high number that mate with the same female, and this is where sperm and how long it lasts is really important," said Dr Durrant.

"If a female bird mates with a number of males, she will keep the sperm until she is ready to release an egg. At this point, long-lived sperm can reactivate and fertilise the egg. So it is not enough to be colourful, you have to have the total package and produce sperm that can last."

"What we are seeing is what evolution has done to these species to solve the problem of competing for mates," adds Dr Durrant.

Journal References:

Kate L. Durrant, Tom Reader, Matthew R. E. Symonds. Pre- and post-copulatory traits working in concert: sexual dichromatism in passerines is associated with sperm morphology. *Biology Letters*, 2020; 16 (1): 20190568 DOI: 10.1098/rsbl.2019.0568



SCIENTISTS UNEXPECTEDLY WITNESS WOLF PUPPIES PLAY FETCH

When it comes to playing a game of fetch, many dogs are naturals. But now, researchers report that the remarkable ability to interpret human social communicative cues that enables a dog to go for a ball and then bring it back also exists in wolves. The study appeared in the journal *iScience* in January.

The findings were made serendipitously when researchers tested 13 wolf puppies from three different litters in a behavioural test battery designed to assess various behaviours in young dog puppies. During this series of tests, three 8-week-old wolf puppies spontaneously showed interest in a ball and returned it to a perfect stranger upon encouragement. The discovery comes as a surprise because it had been hypothesised that the cognitive abilities necessary to understand cues given by a human, such as those required for a game of fetch, arose in dogs only after humans domesticated them at least 15,000 years ago.

“When I saw the first wolf puppy retrieving the ball I literally got goose bumps,” says Christina Hansen Wheat of Stockholm University, Sweden. “It was so unexpected, and I immediately knew that this meant that if variation in human-directed play behaviour exists in wolves, this behaviour could have been a potential target for early selective pressures exerted during dog domestication.”

Hansen Wheat is interested in understanding how domestication affects behaviour. To study this, she and her team raise wolf and dog puppies from the age of 10 days and put them through various behavioural tests. In one of those tests, a person the pup does not know throws a tennis ball across the room and, without the benefit of any prior experience or training, encourages the puppy to get it and bring it back.

The researchers never really expected wolf pups to catch on. In fact, the first two wolf litters they worked with showed little to no interest in balls let alone retrieving one. They thought little of it at the time. It was what they would have expected, after all. That is until they tested the third wolf litter and some of the puppies not only went for the ball, but also responded to the social cues given by the unfamiliar person and brought it back.

“It was very surprising that we had wolves actually retrieving the ball,” says Hansen Wheat. “I did not expect that. I do not think any of us did. It was especially surprising that the wolves retrieved the ball for a person they had never met before.”

Hansen Wheat adds that similarities between dogs and wolves can tell us something about where the behaviour we see in our dogs comes from. And, while it was a surprise to see a wolf puppy playing fetch and connecting with a person in that way, she says, in retrospect, it also makes sense.

“Wolf puppies showing human-directed behaviour could have had a selective advantage in early stages of dog domestication,” she says.

Her team will now continue to work with the data they have collected over the course of three years hand-raising wolves and dogs under identical conditions to learn even more about their behavioural differences and similarities.



Journal References:

Christina Hansen Wheat, Hans Temrin. Intrinsic Ball Retrieving in Wolf Puppies Suggests Standing Ancestral Variation for Human-Directed Play Behavior. *iScience*, 2020; 100811 DOI: 10.1016/j.isci.2019.100811

Zinc: Plaque's natural enemy



BRUCE ADDISON, Veterinary Microbiologist • Addison Biological Laboratory, Inc.



"Plaque forms within 24 hours, calculus within 3 days and gingivitis begins as early as 2 weeks."

— WSAVA.org

Pet oral health care is an ongoing challenge for pet owners and veterinary teams. Periodontal disease is the number one health problem in small animal patients, according to the American Kennel Club. By age 3, more than 80 percent of dogs and cats have some form of periodontal, or gum disease. Pet owner resistance to in-clinic dental procedures that involve x-rays and anesthesia is well known.

To optimize pet health, **the starting point for comprehensive oral care must be in the home** where bad breath is the primary warning sign. Most veterinary clinic personnel miss the opportunity to educate pet owners about daily oral care and promote in-home solutions for their pets.

*Quite simply,
"a chew alone
won't do."*



Working with natural zinc compounds, Addison Biological Laboratory pioneered the use of a natural, zinc-based compound that is safe for daily use, inexpensive, taste-free and provides excellent pet acceptance. The unique formula works to break down plaque on contact and can be used daily without brushing.

Addison's neutralized zinc is a combination of select amino acids and zinc. Taurine and zinc gluconate form a complex bond that inhibits the precipitation of zinc in the neutral pH (6.7 – 7.0) range. In this narrow pH range, an oral zinc preparation delivers increased bioavailability that ensures its duration of effect and efficacy.

"Zinc is well documented to tie up sulfur compounds in the oral cavity which are a primary cause of bad breath, the first signal of impending dental disease." — Bruce Addison, Veterinary Microbiologist, President and Founder

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MAXI/GUARD® Oral Cleansing Wipes

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- Removes plaque; resolves offensive mouth odors
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Customer feedback

"For nearly 30 years, we've promoted dental care, brushing at home and yet still only get around 2 percent compliance. We no longer carry paste and brushes. Oral Cleansing Wipes are our home care focus for every dog and cat. Demonstrating the quick, easy wipe method gives clients confidence to do it at home. Wiping during an exam also shows clients the amount of plaque and oral debris resident in their pet's mouth." JB, DVM



"We keep a jar in every exam room and at the front desk. Everyone in the practice is trained to demonstrate and actively promote home dental care." TLP, RVT, VTS (DENTISTRY)

"Our nurses and DVMs get face to face with pets in every exam. This gives us a chance to smell pets' breath and begin screening for oral health issues. To help pet owners understand, we talk about the smell of the breath as we raise the cheek to examine the teeth and gums." JMC, LVT

Resources available on K9 Gums website, www.k9gums.com.au

MAXI/GUARD® Oral Cleansing Wipes demonstration videos

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[MAXI/GUARD Oral Cleansing Wipes Detail](#)

[MAXI/GUARD Oral Cleansing Wipes Practice Tips](#)

[MAXI/GUARD Dental Client Educational Brochure](#)

Easy, quick, sanitary oral health care for pets.

Related animal health industry materials and references

- [PetHealthNetwork](#). Did you know that 4 out of 5 dogs over the age of 3 years have some sort of periodontal disease?
- [Dentistry for dogs, FETCH by WebMD](#). "...periodontal disease (i.e. gum disease) occurs 5 times as often in pets as it does in people."
- [AVMA](#). Periodontal disease is the most common dental condition in dogs and cats. By the time a pet is 3 years old, it will very likely have some early evidence of periodontal disease. If preventative measures are not taken, it will worsen as the pet grows older.
- [2019 AAHA Dental Care Guidelines for Dogs and Cats](#). The guidelines are intended primarily for general practitioners and veterinary team members without advanced dental training. The dental task force encourages all veterinary professionals to continuously improve their veterinary dentistry knowledge, skills, and treatment capabilities and to recognize cases needing referral.
- [World Small Animal Veterinary Association Global Dental Guidelines](#). Despite its prevalence, periodontal disease is grossly underdiagnosed... Periodontal disease is generally described in two stages: gingivitis and periodontitis.
- [Veterinary Oral Health Council](#). Studies have shown that dogs with severe periodontal disease have more severe microscopic damage in their kidneys, heart muscle and liver than do dogs with less severe periodontal disease.
- Source: [Today's Veterinary Practice](#). Periodontal disease has been called the "silent killer."⁵⁰ Periodontal disease is lurking in patients' mouths whether or not a veterinarian chooses to recognize it.
 - By 2 years of age, 80% of dogs and 70% of cats have some form of periodontal disease.³ Small and toy breed dogs are particularly susceptible.⁴
 - Even after teeth are completely cleaned, plaque forms on the tooth surfaces within 24 hours.^{3,5}
 - Lack of homecare for 1 week can result in gingivitis in some patients; for 3 weeks, in all patients.⁶
 - One veterinary study found that pockets became re-infected within 2 weeks of a dental cleaning if homecare was not performed.⁷



HOW SOME MAMMALS PAUSE THEIR PREGNANCIES

BIOCHEMICAL REASONS FOR LAG TIMES BETWEEN CONCEPTION AND PREGNANCY IN MICE BECAME CLEARER IN A RECENT STUDY

How do some mammals postpone the development of their embryos to await better conditions for having offspring? A recent study at the UW Medicine Institute for Stem Cell and Regenerative Medicine explored this reproductive enigma, which can occur in more than 130 species of mammals as well as in some marsupials.

The study was led by Abdiasis Hussein, a graduate student in the lab of Hannele Ruohola-Baker, UW professor of biochemistry and associate director of UW Medicine's Institute for Stem Cell and Regenerative Medicine. The findings were reported in *Developmental Cell*, a Cell Press scientific journal.

The results not only advance the understanding of delayed embryo implantation, but also suggest how some otherwise rapidly dividing cells, such as those in tumours, become quiescent.

In the suspended state of pregnancy called embryonic diapause, an early-stage embryo refrains from implanting in the mother's uterus, where it could be nourished to grow into a baby. Instead, like a seed, the embryo remains dormant until certain molecular regulators prod it to germinate.

Diapause, or delayed implantation, is a biological strategy for waiting out conditions unfavourable to sustaining newborns, such as lack of food, insufficient maternal fat stores, or older siblings who haven't been weaned.

Bears, armadillos, seals, and some otters, badgers and other weasel-like animals undergo seasonal diapause, as a regular part of their reproductive cycles.

Many types of bears, for example, breed in the late spring or early summer. The female then voraciously hunts for food. Only when the female bear has sufficient body fat and weight will one or more of her embryos implant months later, after she retreats to her den. Any cubs would be born in late winter.

To learn what puts a biochemical hold-and-release on embryonic development, Hussein, Ruohola-Baker and their team induced diapause in a female mouse model by reducing oestrogen levels. They then compared diapause embryos to pre-implantation and post-implantation embryos. They also induced diapause in mouse embryonic stem cells by starving the cells, and compared those to actively growing mouse embryonic stem cells.

In the wild, some animal embryos will delay implantation until

their mother has enough energy and nutrients in her body to support them. Starvation or other stresses somehow provoke an embryonic stop-time. This response is an effort to protect their survival.

The researchers did extensive studies of how metabolic and signalling pathways control both the dormant and active states of mouse embryos and of mouse embryonic stem cells in lab dishes.

Metabolism concerns the life-sustaining chemical activities cells carry out to convert substances into energy, build materials, and remove waste. By analysing these reactions' end products, called metabolites, the scientists could begin to pull together a picture of what happens to cause diapause, and how cells are released from its clutches.

The scientists also looked at gene expression in comparing cell states. They sought to determine what might be influencing how the DNA code was being interpreted, what critical proteins were being produced and in what amounts, in the suspended and active states.

According to embryonic stem cell researcher Ruohola-Baker, epigenetic differences in interpreting the same DNA code, rather than any alterations in the DNA itself, may be key to understanding how embryos enter and exit diapause.

Further investigation pointed to a set of proteins vital in embryonic cell survival. The activity of the genes related to these proteins, as well as levels of certain amino acids, were ramped up in the diapausal embryos. For example, by using CRISPR gene-editing technology, Hussein and Julie Mathieu, UW assistant professor of comparative medicine, squelched the flow of glutamine, an amino acid that controls an important metabolic (energy-use) pathway.

The researchers collected additional data that indicated that this and other metabolic factors influenced a catalytic enzyme, mTOR, that regulates many cell processes, including cell proliferation, growth, and protein synthesis. mTOR is also involved in "sensing" cell nutrient and energy stores.

mTOR is already known to be a central regulator of metabolism and physiology in mammalian ageing and cancer. It also manages aspects of embryonic growth and development. In this study, situations that inhibited mTOR led to the distinct metabolic profile

that characterises diapause. Researchers also found that this inhibition was reversible.

Understanding the mechanisms behind diapause could advance knowledge in medicine, as well as in wildlife biology. Carol Ware, a UW professor of comparative medicine, said that diapause is an essential means of survival for some species, and occurs under environmental stress in others.

Research on the mechanism of diapause in animals is an important step in seeing if this cellular response can be harnessed for clinical therapies, such as better in vitro fertilisation procedures to help people have children.

Hussein believes this line of research might also have significance for future cancer studies. Figuring out why and when cancer cells enter quiescence might help explain their hunkering down to withstand chemotherapy, and reviving themselves later. Perhaps a therapy eventually could be devised, he said, that could wake up the cells to coincide with the timing of anti-cancer drugs.

Journal References:

Abdiasis M. Hussein, Yuliang Wang, Julie Mathieu, Lilyana Margaretha, Chaozhong Song, Daniel C. Jones, Christopher Cavanaugh, Jason W. Miklas, Elisabeth Mahen, Megan R. Showalter, Walter L. Ruzza, Oliver Fiehn, Carol B. Ware, C. Anthony Blau, Hannele Ruohola-Baker. Metabolic Control over mTOR-Dependent Diapause-like State, 2020 DOI:<https://doi.org/10.1016/j.devcel.2019.12.018>



A female elephant seal and her pup on a beach near Big Sur, California. Seals and other pinnepeds are among the mammals whose early-stage embryos can enter diapause - a temporary dormant state - and then implant and develop later. The timing of pregnancy and birth are thereby postponed to occur when conditions are more favorable for survival. Photo Credit: Alice C. Gray

REVOLUTIONARY TREATMENT CURES BELOVED FAMILY PET

A novel immunotherapy treatment has saved family dog Griffin from a rare type of cancer, thanks to collaborative research at The University of Queensland.

The Rottweiler was diagnosed with T cell lymphoma in December 2017 and given three months to live.

UQ's Dr Rachel Allavena and her PhD student, veterinarian Dr Annika Oksa, enrolled Griffin in a medical trial that had helped around 30 per cent of dogs suffering from cancer.

"This is a revolutionary step forward in cancer treatment," Dr Allavena said. "T cell lymphoma is usually a death sentence for dogs, so Griffin is incredibly lucky to be alive. "Our immunotherapy treatment works by 'waking up' the dog's immune system, helping the animal's own body destroy the cancer.

"It's very different to the way we've treated cancer in the past, where we've used surgery, or chemotherapy or radiation, both of which are quite toxic to normal cells.

"Chemotherapy was off the table for Griffin, as it would have made his waste poisonous, which would be dangerous since Griffin's owner, Adam, had a young daughter who played in the backyard."

Once a dog is diagnosed with the cancer, the researchers remove a small piece of the tumour and mix it with an adjuvant - a chemical - to bolster the dog's immune response.

"This gets injected with the vaccine over a number of weeks or months; a process that's very straightforward, much like the regular needles a dog would receive as a puppy," Dr Oksa said.

"We then check the dogs very carefully when they visit to see how the cancer is responding to the treatment and make sure they're doing well."

The researchers have found the vaccine to be extremely safe and

easy to administer, with any veterinarian able to do the surgery required to source the tissue for the vaccine.

"We've treated more than 170 dogs, with no bad side effects in any of them," Dr Oksa said. "It's also safe to do it in combination with other treatments like chemotherapy or radiotherapy and in some cases, like Griffin's, it works well by itself.

"We're incredibly excited to expand the number of dogs we can assist, and send them back home happy and healthy."

The research's institutional collaborators, The University of Sydney and Flinders University, are hoping to expand the research into human trials for similar cancers in years to come.

In the meantime, the treatment has been a gift for Griffin's owner Adam and his family.

"It's great that a medical trial like this exists," he said. "Griffin's part of the family, and now my daughter has her best mate back and I've got my best friend back too - it means the world."



RATS EXCHANGE INFORMATION ABOUT DANGER IN A RECIPROCAL FASHION



Rats exchange information about danger in a reciprocal fashion, and this information transfer is at least partially mediated by a brain region called the anterior cingulate cortex, according to a study published in December in the open-access journal PLOS Biology by Christian Keysers of the Netherlands Institute for Neuroscience and the University of Amsterdam, and colleagues.

The ability to anticipate threats and deploy defensive responses appropriately is key to survival. Rodents have evolved mechanisms to use the response of conspecifics to more selectively deploy defensive behaviour in anticipation of danger. Until now, social transmission of freezing - a behavioural manifestation of fear in rodents - was conceived of as a one-way phenomenon in which an observer perceives the fear of another. In the new study, Keysers and colleagues systematically quantified the transfer of information between rats in the context of danger, and how this information transfer is affected by deactivation of the anterior cingulate cortex - a brain region that contains emotional mirror neurons in rodents. Unlike more traditional methods that focus on one direction of information flow at a time, the methods the researchers introduced allowed them to capture social influences in both directions in the same paradigm. The paradigm they developed in the lab involves a shock-experienced observer rat interacting through a perforated transparent divider with another rat receiving footshocks.

The results suggest that rats exchange information about danger in both directions; how the observer reacts to the other rat's distress also influences how the rat receiving footshocks responds to the danger. This is true to a similar extent across highly familiar and entirely unfamiliar rats, but is stronger in animals pre-exposed to shocks. The effect of pre-exposure suggests that information transfer about danger is not entirely inborn; instead, part of the information transfer depends on some form of learning, similar to cross-species transfer of danger information via eavesdropping. Moreover, deactivating the anterior cingulate of observers reduces freezing in the observers and in the rats receiving the shocks. Taken together, the findings suggest that coupling of freezing across rats could enhance the efficient detection of danger in a group, similar to cross-species eavesdropping.

"What we observed, was striking," said Christian Keysers. "Without the region that humans use to empathise, the rats were no longer sensitive to the distress of a fellow rat. Our sensitivity to the emotions of others is thus perhaps more similar to that of the rat than many may have thought."

They go on to say, "What our data suggest, is that an observer shares the emotions of others because it enables the observer to prepare for danger. It's not about helping the victim, but about avoiding to become a victim yourself."

Journal References:

Yingying Han, Rune Bruls, Efe Soyman, Rajat Mani Thomas, Vasiliki Pentaraki, Naomi Jelinek, Mirjam Heinemans, Igee Bassez, Sam Verschooren, Ilanah Pruis, Thijs Van Lierde, Nathaly Carrillo, Valeria Gazzola, Maria Carrillo, Christian Keysers. Bidirectional cingulate-dependent danger information transfer across rats. PLOS Biology, 2019; 17 (12): e3000524 DOI: 10.1371/journal.pbio.3000524

REJUVENATING ROSEHIP SAVES ENZO

It's estimated that more than 24 million pets live in Australia. Dogs are the most common pet with 38% of households owning a dog. Studies have shown that owning a dog can help individuals maintain a more positive and optimistic perspective on life and better yet, they can lessen the symptoms of depression and anxiety. Thus, proving how dogs are very important members in families and is absolutely heartbreaking when they pass.

Rosehip Vital is a plant-based anti-inflammatory and immune system support for joint health and general wellbeing that transformed Enzo the Staffy's life. Enzo experienced a severe spinal condition and couldn't physically function, causing serious muscle wastage and lead to zero movement in his back legs. Enzo developed extreme depression and had to be pushed in a pram.

Surgery would have been costly along with rehab. However, vets informed the owners that even surgery would have a minor chance of being successful. Due to Enzo's poor quality of life, his owners believed the best way to relieve Enzo from his excruciating pain, was to put the staffy down.

However, Enzo's owners attempted one last time to find a solution to try and save their beloved dog. His owners discovered Rose-Hip Vital Canine with GOPO, which was said to be scientifically and clinically tested natural anti-inflammatory, antioxidant and



Enzo in his pram prior to recovery.

natural vitamin C to relieve and prevent joint pain, stiffness, inflammation and swelling associated with mild arthritis.

Within 3 months of using the product, Enzo was starting to become mobile, was no longer depressed and could play for short periods of time.

Within 6 months his stamina improved immensely and as of last month Enzo no longer needs the pram to be mobilised and can navigate his own steps.

Rose-Hip Vital with GOPO gave Enzo back to his family and brought Enzo back to life.

Watch the video here: https://drive.google.com/open?id=1xysiCT_x9l8e5n3-5VixArApLOG391PO

NEW 'UMBRELLA' SPECIES WOULD MASSIVELY IMPROVE CONSERVATION

The protection of Australia's threatened species could be improved by a factor of seven, if more efficient 'umbrella' species were prioritised for protection, according to University of Queensland research.

Umbrella species are species which when preserved, indirectly protect many other plant and animal species.

UQ PhD candidate Michelle Ward said different choices in Australia could provide more assistance for threatened species.

"The Australian Federal Government's umbrella prioritisation list identifies 73 species as conservation priorities," she said.

"But this only ends up benefiting six per cent of all Australia's threatened terrestrial species.

"This figure could be increased to benefit nearly half of all threatened terrestrial species for the same budget.

"One of the main reasons is that many umbrella species are chosen based on their public appeal, rather than their efficiency for protecting other species - we want to change that."

The researchers investigated what umbrella species could maximise the flora and fauna benefiting from management, while considering threats, actions and costs.

"The koala, red goshawk, matted flax-lily and purple clover are more efficient umbrella species, yet none of these appear on the existing federal government priority species list.

"Australia has committed to prevent further extinction of known threatened species and improve their conservation status by 2020.

"Yet, with limited funding committed to conservation, we need better methods to efficiently prioritise investment of resources."

The study's senior author, UQ and the Nature Conservancy's Professor Hugh Possingham said in a time of crisis, smart decision-making was essential.

"Now is precisely the time where governments need to get their investment in nature to be as efficient as possible," he said.

"Nations around the world can significantly improve the selection of umbrella species for conservation action by taking advantage of our transparent, quantitative and objective prioritisation approach.

"With a species extinction crisis, looming international deadlines and limited conservation funding globally, we need better methods to efficiently prioritise investment of resources in species recovery."

The study, published in Conservation Biology, was conducted by UQ, The Nature Conservancy, the Wildlife Conservation Society and the United Nations Development Program.

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STUDY TRACES EVOLUTION OF ACOUSTIC COMMUNICATION

Imagine taking a hike through a forest or a stroll through a zoo and not a sound fills the air, other than the occasional chirp from a cricket. No birds singing, no tigers roaring, no monkeys chattering, and no human voices, either. Acoustic communication among vertebrate animals is such a familiar experience that it seems impossible to imagine a world shrouded in silence.

But why did the ability to shout, bark, bellow or moo evolve in the first place? In what is likely the first study to trace the evolution of acoustic communication across terrestrial vertebrates, John J. Wiens of the University of Arizona and Zhuo Chen, a visiting scientist from Henan Normal University in Xinxiang, China, traced the evolution of acoustic communication in terrestrial vertebrates back to 350 million years ago.

The authors assembled an evolutionary tree for 1,800 species showing the evolutionary relationships of mammals, birds, lizards and snakes, turtles, crocodylians, and amphibians going back 350 million years. They obtained data from the scientific literature on the absence and presence of acoustic communication within each sampled species and mapped it onto the tree. Applying statistical analytical tools, they tested whether acoustic communication arose independently in different groups and when; whether it is associated with nocturnal activity; and whether it tends to be preserved in a lineage.

The study, published in the open-access journal *Nature Communications*, revealed that the common ancestor of land-living vertebrates, or tetrapods, did not have the ability to communicate through vocalisation - in other words, using their respiratory system to generate sound as opposed to making noise in other ways, such as clapping hands or banging objects together. Instead, acoustic communication evolved separately in mammals, birds, frogs and crocodylians in the last 100-200 million years, depending on the group. The study also found that the origins of communication by sound are strongly associated with a nocturnal lifestyle.

This makes intuitive sense because once light is no longer available to show off visual cues such as colour patterns to intimidate a competitor or attract a mate, transmitting signals by sound becomes an advantage.

Extrapolating from the species in the sample, the authors estimate that acoustic communication is present in more than two-thirds of terrestrial vertebrates. While some of the animal groups readily come to mind for their vocal talents - think birds, frogs and mammals - crocodylians as well as a few turtles and tortoises have the ability to vocalise.

Interestingly, the researchers found that even in lineages that switched over to a diurnal (active by day) lifestyle, the ability to communicate via sound tends to be retained.

“There appears to be an advantage to evolving acoustic communication when you’re active at night, but no disadvantage when you switch to being active during the day,” Wiens said. “We have examples of acoustic communication being retained in groups of frogs and mammals that have become diurnal, even though both frogs and mammals started out being active by night hundreds of millions of years ago.”

According to Wiens, birds kept on using acoustic communication even after becoming diurnal for the most part. Interestingly, many birds sing at dawn, as every birdwatcher can attest. Although

speculative, it is possible that this “dawn chorus” behaviour might be a remnant of the nocturnal ancestry of birds.

In addition, the research showed that acoustic communication appears to be a remarkably stable evolutionary trait. In fact, the authors raise the possibility that once a lineage has acquired the ability to communicate by sound, the tendency to retain that ability might be more stable than other types of signalling, such as conspicuous coloration or enlarged, showy structures.

In another unexpected result, the study revealed that the ability to vocalise does not appear to be the driver of diversification - the rate at which a lineage evolves into new species - it has been believed to be.

To illustrate this finding, Wiens pointed to birds and crocodylians: Both lineages have acoustic communication and go back roughly 100 million years, but while there are close to 10,000 bird species known, the list of crocodylians doesn’t go past 25. And while there are about 10,000 known species of lizards and snakes, most go about their lives without uttering a sound, as opposed to about 6,000 mammalian species, 95% of which vocalise.

“If you look at a smaller scale, such as a few million years, and within certain groups like frogs and birds, the idea that acoustic communication drives speciation works out,” Wiens said, “but here we look at 350 million years of evolution, and acoustic communication doesn’t appear to explain the patterns of species diversity that we see.”

The authors point out that their findings likely apply not only to acoustic communication, but also to other evolutionary traits driven by the ecological conditions known to shape the evolution of species.

While it had been previously suggested that ecology was important for signal evolution, it was thought to apply mostly to subtle differences among closely related species.

**“Here, we show that this idea of ecology shaping signal evolution applies over hundreds of millions of years and to fundamental types of signals, such as being able to communicate acoustically or not.”
Wiens said.**

Journal References:

Zhuo Chen, John J. Wiens. The origins of acoustic communication in vertebrates. *Nature Communications*, 2020; 11 (1) DOI: 10.1038/s41467-020-14356-3



VET HEALTH CHARITY BALL A GREAT SUCCESS

The charity ball supporting the mental health of veterinary professionals was huge success in raising funds for vet life Australia and love your pet, love your vet.

The event was held at the San Remo ballroom in Melbourne and raised over \$34,000 event organiser Sinead Greer said, "The evening highlights were Mr Zed the Zebra ending up on the dance floor

and everyone being able to forget the pressures of the day to day workload and just enjoying themselves."

Also a big thank you to the generous sponsors Cenvet, ZebraVet, Downlow entertainment & Vetpay, Two vets talk pets, Greencross, Brookleigh photography, Medechat, Hills Nutrition, Zoetis and Dermcare.



Sinead Greer speaking in front 400+ guests



Dr Lewis & Dr Robbie from Two vets talk pets podcast did a wonderful job as Master of Ceremonies for the night



Ladies from Bundoora Vet Hospital in their finest ball gowns



Say cheese ladies!



Caitlin Rizzoli's amazing performance



Mr Zed getting plenty of love



Jack's speech, raising funds for LYPLVY & Flynn's walk



Mr Zed takes to the dance floor



Photo booth Fun



Guests dancing the night away



The raffle was a success raising almost \$4000 alone



Let's get ready to party



Gorgeous gowns replaced scrubs for the evening

WSAVA ISSUES GUIDANCE ON PETS AND THE NEW CORONAVIRUS



Michael Lappin
OHC Chair

The World Small Animal Veterinary Association (WSAVA) has prepared an advisory document offering guidance and a series of Frequently Asked Questions to help its members when talking with pet owners concerned about the risk of infection with the new coronavirus (2019 n-CoV), following the outbreak in China.

It also calls on veterinarians to urge owners not to panic because it is highly unlikely that they could contract 2019 n-CoV from their dog or cat, or that their companion animal could transmit the virus to people or other animals.

Dr Michael Lappin, chair of the WSAVA's One Health Committee, recommends that veterinarians tell owners to:

- Keep their companion animals with them if they are self quarantined
- Keep cats inside
- Arrange care for any animals left at home if family or friends are hospitalised
- Contact their veterinarian immediately if they have questions or concerns.

The WSAVA's Scientific Committee and One Health Committee

have worked together to produce the advisory document, which confirms that there is currently no evidence that pets or other domestic animals can be infected with 2019 n-CoV or that they may be a source of infection to people. They do warn, though, that it is a 'rapidly evolving situation'.

The advisory also cautions veterinarians against using vaccines against canine enteric coronavirus available in some global markets in the hope that they may offer some cross-protection against 2019-nCoV. There is no evidence for this, as the new virus is a distinctly different coronavirus variant.

WSAVA President Dr Shane Ryan said "There is still much we don't know about 2019-CoV and, while the priority is to bring the outbreak of the infection caused to people under control as soon as possible, we are concerned for animal welfare with reports of animals being abandoned or killed because their owners fear that they might carry the virus. There is no evidence that this is necessary and we urge our members to ensure owners follow our guidance and keep themselves and their companion animals safe."

The WSAVA's advisory is available here: https://wsava.org/wp-content/uploads/2020/02/nCOV_WSAVA-Advisory-Documents-final-05.02.2020.pdf

ANIMAL OXYGEN MASKS DONATED TO MOST VULNERABLE

PetSafe® Australia last month distributed pet oxygen masks free of charge to various pet hospitals, care facilities and rescue centers across Australia, following the recent devastating and deadly bushfires; as part of the US based Project Breathe™ Program.

"The Project Breathe™ Program is essentially a program that supplies pet oxygen masks to fire departments throughout the USA", comments Zarqa Ali from PetSafe® Australia, "Their goal is to ensure every fire department and rescue unit is equipped with this life-saving masks to help animals of all sizes".

To date they have donated more than 23,500 masks to fire stations across the US and Canada.

"We worked closely with Radio Systems Corporation, where the Invisible Fence Brand falls under, when we found out about the devastation across Australia and the effect it was having on our wildlife and working together we managed to distribute masks to numerous sanctuaries and animal hospitals across the country".

Each mask costs around \$100AUD, PetSafe® Australia secured 35 for distribution across Australia.

The Pet Oxygen Masks are reusable, and fit perfectly on any of our indigenous animals. They are saving numerous koalas, kangaroos, wombats and other small animals.

"We would love for a program like this to be launched here in Australia", continues Zarqa, "and that is something that PetSafe® would definitely support. In the meantime we will continue to help any rescues and sanctuaries dealing with the influx of injured wildlife when and where we can".

Locations that received the masks include:

- Gumby's Kangaroo & Wildlife Sanctuary
- Southern Cross Wildlife Care
- Strong Hearts Farm Sanctuary
- Bush Roo's Rescue
- Gippsland Shelters
- Clover Run Wildlife Sanctuary
- Namagadi Nature Reserve
- Southern Animal Hospital
- Vets for Compassion
- Minton Farm Animal Rescue
- Port Macquarie Koala Sanctuary



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THE ‘PURRFECT’ MUSIC FOR CALMING CATS

Taking a cat to the vets can be a stressful experience, both for cat and owner. However, a study published in this month's issue of the *Journal of Feline Medicine and Surgery (JFMS)*¹ has shown that playing cat-specific music during the visit can help.

The use of music has become increasingly popular in human medicine, with studies showing a range of benefits, from improving motor and cognitive function in stroke patients to reducing anxiety associated with medical examinations, diagnostic procedures and surgery. The benefits of music are also being investigated in cats and other animals. Research published previously in *JFMS* has indicated that cats that are under general anaesthesia remain physiologically responsive to music;² furthermore, they appear to be in a more relaxed state when played classical music, compared with pop and heavy metal.³

In this latest study, researchers at Louisiana State University (LSU), USA, have taken the analysis of the impact of different types of music a step further by exploring the calming effects of music composed specifically for cats. Musical pieces that are considered pleasing to the human ear often have a beat similar to the human resting pulse rate and contain frequencies from the human vocal range. This principle has been extended to cat-specific music, which is composed of lines based on affiliative cat vocalisations, such as purring and suckling sounds, as well as frequencies similar to the feline vocal range, which is two octaves higher than for humans.

In order to assess the effects of cat-specific music, 20 pet cats enrolled in the LSU study were played 20 minutes of cat-specific music, classical music ('*Élégie*' by Fauré) or no music (silence) in a random order at each of three physical examinations at the veterinary clinic, 2 weeks apart.

Cat stress scores, based on the behaviour and body posture of the cats, and handling scale scores, based on the cats' reactions to the handler, were assigned for each of the cats from video recordings of the examinations; neutrophil:lymphocyte ratios from blood samples were also measured to look for a physiological stress response.

The study found that the cats appeared to be less stressed during the examination - as indicated by lower cat stress scores and handling scale scores - when played the cat-specific music, compared with both classical music and no music. This effect was not reflected in the neutrophil:lymphocyte ratio, but the researchers suggest that 20 minutes may not have been long enough to allow music to affect this measure.

By decreasing stress levels, the researchers conclude that cat-specific music may not only have benefits in terms of the welfare of the cat, but owners can feel reassured that their cat will have a more comfortable visit, and the veterinary team will be able to assess their feline patients more accurately.



References:

1. Hampton A, Ford A, Cox RE III, et al. Effects of music on behavior and physiological stress response of domestic cats in a veterinary clinic. *J Feline Med Surg* 2020; 22: 122-128. The article is currently free to read here: <https://journals.sagepub.com/doi/full/10.1177/1098612X19828131>
2. Mira F, Costa A, Mendes E, et al. A pilot study exploring the effects of musical genres on the depth of general anaesthesia assessed by haemodynamic responses. *J Feline Med Surg* 2016; 18: 673-678.
3. Mira F, Costa A, Mendes E, et al. Influence of music and its genres on respiratory rate and pupil diameter variations in cats under general anaesthesia: contribution to promoting patient safety. *J Feline Med Surg* 2016; 18: 150-159.

Journal References:

Amanda Hampton, Alexandra Ford, Roy E Cox, III. Effects of music on behavior and physiological stress response of domestic cats in a veterinary clinic. 2020; DOI: 10.1177/1098612X19828131

ANTIBIOTIC RESISTANCE SURPRISINGLY STABLE IN PIGS

Antimicrobial resistance gene counts did not change in response to antibiotic treatment. AMR gene counts did not change in response to antibiotic treatment.

Long term, historic use of antibiotics has resulted in antimicrobial resistance genes being stably integrated at high levels on a commercial pig farm.

The findings highlight the extent of antimicrobial resistance (AMR) - which can limit the effectiveness of antibiotic treatments - in livestock production and the environment.

AMR gene counts were relatively stable over time and did not appear to change in response to antibiotic treatment or significant reductions in overall farm antibiotic use, suggesting that high historic use has resulted in the genes becoming stably integrated into the gut flora.

A total of 144 different AMR genes were identified on the farm. Five individual AMR genes were tracked over a full production cycle and were present in high concentrations, in the order of tens, hundreds and thousands of millions of copies per gram of pig faeces.

Antimicrobial usage

The study followed a batch of piglets through a full production cycle on a commercial pig unit with high antimicrobial usage.

The farm was also followed during a partial depopulation, where all the young pigs on the farm were removed and all the sows treated with two antibiotics.

The antimicrobial medication being administered was still effective in limiting diseases on the farm, despite the high levels of resistance genes in the gut flora, the scientists found.

The study was led by researchers at the Roslin Institute, in collaboration with Scotland's Rural College (SRUC).

Surprising discovery

"We expected to see big changes in AMR genes in response to antibiotic treatment, but instead we found high levels of these genes in both the presence and absence of antibiotics. This would suggest that these genes have become stably integrated into the bacteria in the pigs' intestines. Further work will be necessary to determine which bacteria are acting as the reservoir of these genes," said Dr Alexander Corbished, Senior Lecturer in

Farm Animal Practice, the Roslin Institute, University of Edinburgh






The study, published in the journal *Scientific Reports*, was funded by the Natural Environment Research Council as part of the AMR Cross Council Initiative and the Scottish Government.

Journal References:

Pollock, J., Muwonge, A., Hutchings, M.R. et al. Resistance to change: AMR gene dynamics on a commercial pig farm with high antimicrobial usage. *Sci Rep* 10, 1708 (2020). <https://doi.org/10.1038/s41598-020-58659-3>






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