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THE AUSTRALIAN VETERINARIAN

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DOGS (NOT) GONE WILD: DNA TESTS SHOW MOST ‘WILD DOGS’ IN AUSTRALIA ARE PURE DINGOES

IT’S TIME TO TAKE DINGOES OUT OF THE DOGHOUSE

Almost all wild canines in Australia are genetically more than half dingo, a new study led by UNSW Sydney shows - suggesting that lethal measures to control ‘wild dog’ populations are primarily targeting dingoes.

The study, published today in Australian Mammalogy, collates the results from over 5000 DNA samples of wild canines across the country, making it the largest and most comprehensive dingo data set to date.

The team found that 99 per cent of wild canines tested were pure dingoes or dingo-dominant hybrids (that is, a hybrid canine with more than 50 per cent dingo genes).

Of the remaining one per cent, roughly half were dog-dominant hybrids and the other half feral dogs.

“We don’t have a feral dog problem in Australia,” says Dr Kylie Cairns, a conservation biologist from UNSW Science and lead author of the study. “They just aren’t established in the wild.

“There are rare times when a dog might go bush, but it isn’t contributing significantly to the dingo population.”

The study builds on a 2019 paper by the team that found most wild canines in NSW are pure dingoes or dingo-dominant hybrids. The newer paper looked at DNA samples from past studies across Australia, including more than 600 previously unpublished data samples.

Pure dingoes - dingoes with no detectable dog ancestry - made up 64 per cent of the wild canines tested, while an additional 20 per cent were at least three-quarters dingo.

The findings challenge the view that pure dingoes are virtually extinct in the wild - and call to question the widespread use of the term ‘wild dog’.

“’Wild dog’ isn’t a scientific term - it’s a euphemism,” says Dr Cairns.

“Dingoes are a native Australian animal, and many people don’t like the idea of using lethal control on native animals.

“The term ‘wild dog’ is often used in government legislation when talking about lethal control of dingo populations.”

The terminology used to refer to a species can influence our underlying attitudes about them, especially when it comes to native and culturally significant animals.

This language can contribute to other misunderstandings about dingoes, like being able to judge a dingo’s ancestry by the colour of its coat - which can naturally be sandy, black, white, brindle, tan, patchy, or black and tan.

“There is an urgent need to stop using the term ‘wild dog’ and go back to calling them dingoes,” says Mr Brad Nesbitt, an Adjunct Research Fellow at the University of New England and a co-author on the study.

“Only then can we have an open public discussion about finding a balance between dingo control and dingo conservation in the Australian bush.”

Tracing the cause of hybridisation

While the study found dingo-dog hybridisation isn’t widespread in Australia, it also identified areas across the country with higher traces of dog DNA than the national average.

Most hybridisation is taking place in southeast Australia - and particularly in areas that use long-term lethal control, like aerial baiting. This landscape-wide form of lethal control involves dropping meat baits filled with the pesticide sodium fluoroacetate (commonly known as 1080) into forests via helicopter or airplane.

“The pattern of hybridisation is really stark now that we have the whole country to look at,” says Dr Cairns.

“Dingo populations are more stable and intact in areas that use

That's not my name: 99 per cent of wild canines in Australia are pure dingoes or dingo-dominant hybrids, but they're being labelled as 'wild dogs'.
CREDIT: Chontelle Burns / Nouveau Rise Photography.

less lethal control, like western and northern Australia. In fact, 98 per cent of the animals tested here are pure dingoes.

"But areas of the country that used long-term lethal control, like NSW, Victoria and southern Queensland, have higher rates of dog ancestry."

The researchers suggest that higher human densities (and in turn, higher domestic dog populations) in southeast Australia are likely playing a key part in this hybridisation.

But the contributing role of aerial baiting - which fractures the dingo pack structure and allows dogs to integrate into the breeding packs - is something that can be addressed.

"If we're going to aerial bait the dingo population, we should be thinking more carefully about where and when we use this lethal control," she says.

"Avoiding baiting in national parks, and during dingoes' annual breeding season, will help protect the population from future hybridisation."

Protecting the ecosystem

Professor Mike Letnic, senior author of the study and professor of conservation biology, has been researching dingoes and their interaction with the ecosystem for 25 years.

He says they play an important role in maintaining the biodiversity and health of the ecosystem.

"As apex predators, dingoes play a fundamental role in shaping ecosystems by keeping number of herbivores and smaller predators in check," says Prof. Letnic.

"Apex predators' effects can trickle all the way through ecosystems and even extend to plants and soils."

Prof. Letnic's previous research has shown that suppressing dingo populations can lead to a growth in kangaroo numbers, which has repercussions for the rest of the ecosystem.

For example, high kangaroo populations can lead to overgrazing, which in turn damages the soil, changes the face of the landscape and can jeopardise land conservation.

A study published last month found the long-term impacts of these changes are so pronounced they are visible from space.

But despite the valuable role they play in the ecosystem, dingoes are not being conserved across Australia - unlike many other native species.

"Dingoes are a listed threatened species in Victoria, so they're protected in national parks," says Dr Cairns. "They're not protected in NSW and many other states."

The need for consultation

Dr Cairns, who is also a scientific advisor to the Australian Dingo Foundation, says the timing of this paper is important.

"There is a large amount of funding currently going towards aerial baiting inside national parks," she says. "This funding is to aid bushfire recovery, but aerial wild dog baiting doesn't target invasive animals or 'wild dogs' - it targets dingoes.

"We need to have a discussion about whether killing a native animal - which has been shown to have benefits for the ecosystem - is the best way to go about ecosystem recovery."

Dingoes are known to negatively impact farming by preying on livestock, especially sheep.

The researchers say it's important that these impacts are minimised, but how we manage these issues is deserving of wider consultation - including discussing non-lethal methods to protect livestock.

"There needs to be a public consultation about how we balance dingo management and conservation," says Dr Cairns. "The first step in having these clear and meaningful conversations is to start calling dingoes what they are.

"The animals are dingoes or predominantly dingo, and there are virtually no feral dogs, so it makes no sense to use the term 'wild dog'. It's time to call a spade a spade and a dingo a dingo.

WORLD-FIRST: LUXURY FAREWELLS FOR FUR BABIES

Pet owners can now say farewell in heavenly luxury, listening to their beloved animal's favourite tune as their fur baby is gently driven away to its final resting place in a Mercedes Benz fitted with custom leather and timber interior.

High demand from discerning customers and a desire to offer the highest quality service possible has led Pet Angel Funerals, servicing south-east Queensland and Northern New South Wales, to add two luxury vehicles to its fleet.

"We have only had Pet 1 and Pet 2 on the road for a few days now and we have been inundated with inquiries," said Pet Angel Funerals founder Tom Jorgensen.

"This sophisticated service will make pet owners and their deceased fur babies feel extra special. It's about the finer details like having stunning white roses and special music playing in the Mercedes with your pet. We want pet owners' minds to be at ease, knowing their angel is being taken to the crematorium in a most beautiful way."

He said the new deluxe service package, available from $575, included Australian-made memorial products and collection of pets by a uniformed chauffeur.

Pet Angel Funerals is now south-east Queensland's largest independent family-owned pet crematorium, caring for around 800 families a month. Mr Jorgensen said that despite the sadness surrounding pet deaths, he was pleased more pet owners were calling upon the Pet Angel team to help them say goodbye to their furry friends with grace and dignity.

YOU ARE NOT A CAT, BUT A CAT COULD SOMEDAY HELP TREAT YOUR CHRONIC KIDNEY DISEASE

WINSTON-SALEM, NC - March 12, 2021 - The Wake Forest Institute for Regenerative Medicine is investigating how cats with chronic kidney disease could someday help inform treatment for humans.

In humans, treatment for chronic kidney disease -- a condition in which the kidneys are damaged and cannot filter blood as well as they should -- focuses on slowing the progression of the organ damage. The condition can progress to end-stage kidney failure, which is fatal without dialysis or a kidney transplant. An estimated 37 million people in the US suffer from chronic kidney disease, according to the Centres for Disease Control.

The American Veterinary Medical Association estimates there are about 58 million cats in the United States. Chronic kidney disease affects 30-50% of cats age 15 years or older. The fibrosis or scarring that occurs as a result of the disease is a common final pathway for kidney disease in both animals and people. For cats, end-stage kidney disease has no effective cure.

In a new study published online by Frontiers in Veterinary Science in the Veterinary Regenerative Medicine platform, the WFIRM research team set out to test the effects of a cell-derived molecular therapy to treat kidney fibrosis in cats. Regenerative therapies using stem cells and vascular fractions have been tested, but the collection of cells or cell fractions is expensive, time consuming, and requires advanced cell processing capabilities not available in most veterinary general practices.

Alternatively, "The use of cell-based molecules to treat kidney fibrosis may be a promising approach," said lead author Julie Bennington, DVM, a WFIRM research fellow and PhD candidate.

"Current treatments include pharmaceutical therapies and dietary management to slow disease progression and increase longevity, and alternatives are needed."

In this study, authors used a cell-signalling chemokine -- CXCL12 -- that is produced by cells and stimulates tissue regeneration. Recombinant human CXCL12 is commercially available, inexpensive, and has been shown to reduce fibrosis in rodent models of chronic kidney disease.

The goal of this study was to test the safety, feasibility, and efficacy of ultrasound-guided intra-renal CXCL12 injection in cats with chronic kidney fibrosis, first in a preclinical cat model, and, then in a pilot study in cats that may have early kidney disease.

"Results of these studies together show that intra-renal injection of CXCL12 may be a potential new therapy to treat early kidney disease in cats with a capability for widespread use," said co-author Koudy Williams, DVM, also of WFIRM. "Further clinical evaluations are needed."

Piedmont Animal Health, the company that funded the research, is preparing to set up a clinical pilot study in the US, and Bennington will serve as a consultant.

WFIRM Director Anthony Atala, MD, said this research is a good example of "how a condition like chronic kidney disease, common to both dogs and cats, can be studied and potentially applied to the disease in humans."

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AUSTRALIA'S MOST WANTED

The Australian government has lifted an exemption into veterinarians from abroad to enter Australia under the skilled migrants occupations list.

The AVA held the virtual Workforce Shortage Forum in early May 2021 and welcomed all veterinary professionals to this discussion. Over 1200 vets tuned in to discuss everything from education debt, insurance, rebates, regional shortage, wages and mental health

Corporate Veterinary companies say moves to fast-track the arrival of overseas vets into Australia will not be enough to fill crucial gaps in regional and rural areas. The AVA estimate at least 800 more vets are required across Australia; however corporates like Greencross, Apiam and Vet Partners believe the number is closer to 1500.

The recent covid-19 puppy boom, lack of migration vets and qualified veterinarians leaving the industry has made demand a major problem. The industry over the years has suffered from poor pay, poor hours and an expectation that has left vets questioning their self-worth.

The AVA believes the pandemic has increased veterinarian demand by up to 30% and that alone will send a workforce into overdrive. Regional Australia has always suffered; but now it has hit the big smoke and the expat travelling vets are covid-19 stranded.

Now that the federal government added veterinarians to Australia's Priority Migration Skilled Occupation List in response to critical national staffing shortages; we can hope the industry receives a plethora of applications

The bigger picture needs to be addressed a new business model for the delivery of veterinary services that is sustainable and inviting for those wanting to choose it as a career.

MORE PARTNERS REQUIRED

The veterinary industry has experienced retention challenges in recent years due to an ever-increasing number of veterinarians opting not to remain in the profession for the medium to longer term, or choosing to work reduced hours.

While the industry attracts highly compassionate and giving people, many put caring for their patients ahead of their own well-being and self-care, leading to burn-out. This has resulted in vets following a different career path or not returning after taking parental leave.

"Many veterinarians want to leave the profession or reduce their hours due to mental and physical stress created by long working days and demanding caseloads," said Dr. Brett Hodgkin, VetPartners' Chief Veterinary Officer.

"The issue is even more acute in regional parts of Australia where chronic veterinary shortages and after-hour services put pressure on already overworked veterinarians.

"It's important that we find better ways to support veterinarians working in more isolated communities." Dr. Hodgkin said.

The conditions brought about by the pandemic have created additional pressure on teams in the clinics who have dealt with a significant increase in patient numbers and have been forced to practice in different ways.

"We saw pet ownership increase considerably last year, and people are now home with their pets more. This boosted the demand for veterinary services, which places a greater strain on an already challenged supply of available vets," he said.

"The introduction of new protocols, closure of international borders, and our inability to recruit overseas veterinarians and nurses have further exacerbated the problem and is still taking a toll on our workforce," Dr. Hodgkin said.

The Australian government has now confirmed the veterinarians would be placed on the Priority Migration Skilled Occupation List. While this will relieve some of the pressure, Dr. Hodgkin said there are other challenges to consider.

"The pandemic has highlighted the importance of human-animal bond in society and resulted in increased public demand for veterinary services, but it has also emphasised the retention and well-being challenges in our profession.

"We need to focus on the root causes, and universities, professional bodies, corporates, independents, and public health sectors need to work together to find and implement solutions," Dr. Hodgkin said.

Dr. Hodgkin believes that some of the retention issues could be solved by: looking at the structure of working weeks, providing support around structured career pathways, better utilising nurses capabilities, improving salary and recognition, an improved selection criteria processes at universities, using technology to support more isolated veterinarians professionally, and providing better personal coaching and well-being support.

VetPartners recently launched a new paid parental leave program to help attract and retain more veterinary professionals. While it's still early days, Dr. Hodgkin said he hopes it encourages veterinarians, nurses, and managers to stay in the industry.

"By offering extra benefits to our team members, providing flexible rostering and work schedules, and improving the safety and well-being for people in clinics, we can provide better working conditions than we have traditionally seen in the profession," he said.

Dr. Hodgkin believes upskilling of nurses can also lead to better utilisation of their highly valued skills, which will help reduce some of the capacity pressures on our veterinarians in the clinic.

"We offer continuous clinical training to all our veterinary team members to support their growth and development.

"Our super nurse program provides extra training to our qualified nurses to empower them to be more involved in the delivery of patient care. We have multiple purpose-built training facilities across all of our regions to deliver free ongoing professional training for our clinical team members," Dr. Hodgkin said.

BUSH BEST FOR ALL VETS

Australia is experiencing a shortage of vets with the impact felt most across regional towns. The vet shortage is continuing to bite regional and rural areas as the agriculture industry expands and COVID-19 drives an increase in companion animal ownership.

Chris Richards, managing director of Apiam Animal Health, a regionally based Australian Veterinary Group said that while government incentives were needed to attract graduates to regional centres employers needed to think outside the square to provide more attractive, sustainable working conditions.

"Apiam's Employee Value Proposition (EVP) is focused on positioning Apiam as an employer of choice. Our EVP has provided, amongst other flexible arrangements, paid parental leave to both primary and secondary carers since 2019. Thirty-nine of our employees have utilised Apiam's paid parental leave program and it is encouraging to see more companies within our industry offering benefits that provide flexible working conditions", Dr Richards said.

Dr Gemma Chuck, (Dairy Veterinary Operations at Apiam) added that as an industry employer, Apiam has stood out from the pack by providing the opportunity for talented female workers to balance their work/life needs.

"I'm a mother of two young children, and I don't think I could've asked for a more supportive employer," Dr Chuck said.

In fact, Dr Chuck was 20 weeks pregnant with a newly minted PhD when Apiam hired her. And shortly after that she went on maternity leave.

"In the 21st century, it shouldn't matter. But it kind of does and it certainly did to me. Before accepting my new role, I shared my news with my prospective manager and was pleasantly surprised by his reaction. Apiam were really able to see the bigger picture and stay flexible and accommodating around my new family commitments.", Dr Chuck said.

Another initiative that supports vets to provide a sustainable and effective after hours service has been the introduction of Apiam's dedicated after-hours triage service staffed by experienced and qualified vet nurses. Another first in the field.

Dr Richards said that "since inception the service has resolved over 50% of after-hours calls without having to disturb vets overnight. Apiam's triage service ensures our rural communities have access to vets twenty-four hours a day without placing unnecessary pressure on vets where calls may be not urgent and can be resolved by our experienced nursing team".

"When our vets do need to go out they are fully briefed by the triage team and prepared for the case they are attending", Dr Richards added.

With clinics spread across Australia's farming centres, Apiam is able to move vets between clinics to cover increased seasonal demand or unexpected staff shortages at short notice, helping to reduce the pressure in individual clinics at such times.

"The added advantage", said Dr Richards, "is that Apiam vets get to experience a range of environments and species across production, farm and domestic pets".

Rural vets are very much part of the communities they work in and experience the highs and lows of farming life alongside their clients. There has been much reporting on the mental health issues experienced by both vets and rural producers. While Apiam Animal Health has a well-established Employee Assistance Program they recognised the need to extend this to their clients.

"The Apiam Animal Health Client Assistance Program is a unique program that delivers support to clients when times are tough. This in turn helps to reduce the day-to-day stress our vets experience as they work closely with farming families", Dr Richards said, adding that "knowing they can offer tangible support beyond veterinary requirements to their clients during traumatic or difficult times helps our vets deal with the tough times too".

"Dr Chris Richards said that "Apiam's focus on wellbeing is outlined in our Mental Health Strategy launched in 2020. Part of the strategy is a commitment to training Mental Health First Aid Officers in all primary locations, a target that has been achieved. An additional paid leave day is also available for employees to support mental wellbeing at Apiam and we have financially supported wellbeing activities initiated at clinic level by our teams.

"We value the skills and experience of our veterinarians at all stages of their careers" Dr Richards added.

"Apiam Animal Health's Kyabram Veterinary Clinic is an exceptional place to work. The vets and support staff at KVC pride themselves on a great team environment and a high standard of care, the clinic facilities are unreal, and the wider community and clientele are incredibly friendly and conscientious. I have loved my six years as part of the KVC team and could not have hoped for a more progressive or supportive workplace." Dr Lucy Collins BSc (Ag), DVM

DOG'S BODY SIZE AND SHAPE COULD INDICATE A GREATER BONE TUMOR RISK

Osteosarcoma is a painful and aggressive bone tumour in dogs that is known to be more common in certain breeds than others. New research has now confirmed that larger breeds, such as Rottweiler, Great Dane and Rhodesian Ridgeback, have a greater risk of osteosarcoma than smaller breeds, as well as showing that breeds with shorter skulls and legs have lower osteosarcoma risk. The findings could inform future breed health reforms as well as studies into the way tumours develop from normal bone.

The study led by the University of Bristol Veterinary School in collaboration with Cardiff University and Royal Veterinary College (RVC) London, and using data from VetCompass™ and Veterinary Pathology Group (VPG) histology, looked at the epidemiology surrounding which dog breeds get osteosarcoma, and what this means for canine welfare. This study also shows the huge benefits from studying dogs as a model to study this cancer. The findings are published in Canine Medicine and Genetics today [10 March].

The study included 1,756 laboratory-confirmed osteosarcoma cases in dogs compared with 905,211 dogs under veterinary care in the VetCompass™ database during 2016.

The research team found twenty-seven breeds, mainly larger breeds, had an increased risk of osteosarcoma compared to crossbreeds. Thirty breeds, mainly smaller breeds, including Jack Russell, Border Terrier, Bichon Frise, French Bulldog, Cavalier King Charles Spaniel, had reduced risk of osteosarcoma compared to crossbreeds.

The study also compared various measures of body mass and leg length, and confirmed previous findings that heavier dogs with longer legs and longer skull shapes are at greatest risk of bone tumours. The results could inform breed health reforms, especially in predisposed breeds such as the Rottweiler, Great Dane and Rhodesian Ridgeback, Mastiff and German Pointer. Whereas previous studies have identified high-risk breeds for bone tumours, this paper is novel by being able to identify breeds at lowest risk because of the huge size of the study population. The breeds identified here could be researched and compared to recognise novel genetic differences which cause bone tumours.

The findings that bone tumours are more common in certain breeds and conformations indicates that a dog's genetics play a role in bone tumour development. This link between the biology of conformation and the biology of bone tumours in dogs provides valuable opportunities for further study into what causes bone tumours to develop, and how they could be treated in the future.

Osteosarcoma can affect any dog breed. However, owners of high-risk breeds should be especially alert for signs of the disease. These include lameness and painful, bony swelling and dog owners should contact their vet if concerned.

Dr Grace Edmunds, Clinical Veterinary Research Fellow and lead author at Bristol Veterinary School, said: "As a vet, I am always focussed on improving animal welfare by looking outwards to find new treatments for their diseases. As osteosarcoma also affects adolescents, it is hugely exciting that by understanding the biology of bone tumours, and working with my collaborators in human cancer research, we may make a difference to both canine and human cancer patients."

Dr Dan O'Neill, Senior Lecturer in Companion Animals Epidemiology at the RVC, added: "There are increasing concerns about the wisdom of breeding dogs with extreme body shapes such as flat-faced breeds like French Bulldogs or breeds with long backs such as Dachshunds.

"This study highlights the health risks from another extreme body shape -- large body size. The breeds at highest risk of osteosarcoma were large-sized breeds such as Rottweiler, Great Dane and Mastiff. To reduce the risks of picking a dog that may develop bone cancer, owners may need to consider choosing puppies from smaller-sized parents of these giant breeds or opting for different smaller breeds instead."

Professor Rachel Errington at Cardiff University explained: "As a human cancer researcher at the School of Medicine this study shows that we can propose similar questions in human and canine disease with the aim of determining new therapies and diagnostics for both and this provides an exciting opportunity of joining forces across a diverse group of expertise."

The research team is currently developing a project that will sequence certain genes in at-risk and protected breeds for osteosarcoma, with the aim of identifying those genetic pathways that cause bone tumours to develop from normal bone. Identifying such pathways will allow new drugs, or older, repurposed drugs, to be used to see if the outcomes when treating bone tumours in dogs can be improved.

Drs Grace Edmunds and Helen Winter, members of the study team, will be engaging with owners of dogs with cancer and younger patients who have had cancer as part of a One Health approach, and they would welcome contact from patients or dog owners who would like to participate in this research.

Journal Reference:

Grace L. Edmunds, Matthew J. Smalley, Sam Beck, Rachel J. Errington, Sara Gould, Helen Winter, Dave C. Brodbelt, Dan G. O'Neill. Dog breeds and body conformations with predisposition to osteosarcoma in the UK: a case-control study. Canine Medicine and Genetics, 2021; 8 (1) DOI: 10.1186/s40575-021-00100-7

MUMMIFIED PARROTS POINT TO TRADE IN THE ANCIENT ATACAMA DESERT

Ancient Egyptians mummified cats, dogs, ibises and other animals, but closer to home in the South American Atacama desert, parrot mummies reveal that between 1100 and 1450 CE, trade from other areas brought parrots and macaws to oasis communities, according to an international and interdisciplinary team.

"Feathers are valued across the Americas and we see them in high-status burials," said José M. Capriles, assistant professor of anthropology, Penn State. "We don't know how the feathers got there, the routes they took or the network."

Parrots and macaws are not native to the Atacama, which is in northern Chile and is the driest desert in the world, but archaeologists have found feathers in burial context and preserved in leather boxes or other protective material, and they have also found mummified birds -- parrots and macaws -- at archaeological sites.

"The fact that live birds made their way across the more-than-10,000-foot-high Andes is amazing," said Capriles. "They had to be transported across huge steppes, cold weather and difficult terrain to the Atacama. And they had to be kept alive."

Capriles, an archaeologist, grew up around parrots and macaws because his father was a wildlife manager and his mother, Eliana Flores Bedregal, was a Bolivian ornithologist at the Museo Nacional de Historia Natural in La Paz until her death in 2017.

While a postdoctoral fellow in Chile, Capriles investigated the trade and transport of goods like coca, shell, metals, feathers and animals around Bolivia, Peru and Chile.

"Calogero Santoro, professor of anthropology at Universidad de Tarapacá, mentioned the birds to my mother when she came to visit and suggested we study them," said Capriles. "Our idea was to say something about these parrots, where they were coming from and what species were represented. My mother is a coauthor on this paper."

Most parrot and macaw remains, whether mummified or not, reside in museums. The team visited collections around northern Chile for nearly three years looking at a wide range of what had been found.

"Once we started working on this, we found so much material about macaws and parrots," said Capriles. "Columbus took parrots back to Europe and the historical importance of macaw feathers for pre-Columbian societies was ubiquitous."

Most of the bird remains the researchers found date to between 1000 and 1460 CE, beginning at the end of the Tiwanaku empire and just before the Inca came through the area. According to Capriles, it was a time of warfare, but also a great time for commerce, with frequent llama caravans moving about.

The researchers studied 27 complete or partial remains of scarlet macaws and Amazon parrots from five oasis sites in the Atacama. They report their results today (Mar. 29) in the Proceedings of the National Academy of Sciences.

Using zooarchaeological analysis, isotopic dietary reconstruction, radiocarbon dating and ancient DNA testing, the research catalogued scarlet macaws and at least five other parrot species that were transported from over 300 miles away in the eastern Amazon. The team mapped the distinct natural habitation ranges of scarlet macaws, blue and yellow macaws and the various parrots to try to determine how they traveled to the Atacama.

The researchers also found that the birds were eating the same diet as the agriculturalists who owned them.

"What we consider acceptable interactions with animals under our care was very different back then," said Capriles. "Some of these birds did not live a happy life. They were kept to produce feathers and their feathers were plucked out as soon as they grew in."

Perhaps more unusual than the import of parrots and macaws and their usefulness in feather production was their treatment after death. Many of the parrots were found mummified with their mouths wide open and their tongues sticking out. Others had their wings spread wide in permanent flight.

"We have absolutely no idea why they were mummified like this," said Capriles. "They seem to be eviscerated through their cloaca (a common excretory and reproductive opening), which helped to preserve them. Many times, they were wrapped in textiles or bags."

Unfortunately, many of the birds were salvage finds -- acquired outside of formal archaeological projects -- so some types of data are missing, but the birds are typically associated with human burials.

The majority of the mummies were found at Pica 8, a site near an oasis community that still exists today as a locus of goods transport. Pica 8 had agriculture during the time the birds lived there and is currently the source of prized lemons.

"We know that the birds were living there," said Capriles. "That they were eating the same foods that people were eating enriched with the nitrogen from maize fertilised with marine bird manure. Llamas are not the best pack animals, because they aren't that strong. The fact that llama caravans brought macaws and parrots across the Andes and across the desert to this oasis is amazing."

Journal Reference:

José M. Capriles, Calogero M. Santoro, Richard J. George, Eliana Flores Bedregal, Douglas J. Kennett, Logan Kistler, Francisco Rothhammer. Pre-Columbian transregional captive rearing of Amazonian parrots in the Atacama Desert. Proceedings of the National Academy of Sciences, 2021; 118 (15): e2020020118 DOI: 10.1073/pnas.2020020118

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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Jan Bellows, DVM, Dipl AVDC, ABVP ALL PETS DENTAL, Weston, Florida

FEED FIDO FRESH HUMAN-GRADE DOG FOOD TO SCOOP LESS POOP

URBANA, Ill. - For decades, kibble has been our go-to diet for dogs. But the dog food marketplace has exploded in recent years, with grain-free, fresh, and now human-grade offerings crowding the shelves. All commercial dog foods must meet standards for complete and balanced nutrition, so how do consumers know what to choose?

A new University of Illinois comparison study shows diets made with human-grade ingredients are not only highly palatable, they're extremely digestible. And that means less poop to scoop. Up to 66% less.

"Based on past research we've conducted I'm not surprised with the results when feeding human-grade compared to an extruded dry diet," says Kelly Swanson, the Kraft Heinz Company Endowed Professor in Human Nutrition in the Department of Animal Sciences and the Division of Nutritional Sciences at Illinois, and co-author on the Journal of Animal Science study. "However, I did not expect to see how well the human-grade fresh food performed, even compared to a fresh commercial processed brand."

Swanson and his team fed beagles four commercially available diets: a standard extruded diet (kibble); a fresh, refrigerated diet; and two fresh diets made using only USDA-certified human-grade ingredients. These fresh diets include minimally processed ingredients such as beef, chicken, rice, carrots, broccoli, and others in small chunks or a sort of casserole. The dogs consumed each diet for four weeks.

The researchers found that dogs fed the extruded diet had to eat more to maintain their body weight, and produced 1.5 to 2.9 times as much poop as any of the fresh diets.

"This is consistent with a 2019 National Institute of Health study in humans that found people eating a fresh whole food diet consumed on average 500 less calories per day, and reported being more satisfied, than people eating a more processed diet," Swanson says.

The researchers also found that the fresh diets uniquely influenced the gut microbial community.

"Because a healthy gut means a healthy mutt, fecal microbial and metabolite profiles are important readouts of diet assessment," Swanson says. "As we have shown in previous studies, the fecal microbial communities of healthy dogs fed fresh diets were different than those fed kibble. These unique microbial profiles were likely due to differences in diet processing, ingredient source, and the concentration and type of dietary fibres, proteins, and fats that are known to influence what is digested by the dog and what reaches the colon for fermentation."

Commercially available, fresh prepared whole-food diets have been around for a decade and despite anecdotal reports of health benefits, some nutrition experts were concerned about a lack of scientific evidence to support the feeding of these diets. Swanson published an earlier study in roosters to show the same human-grade fresh diets were up to 40% more digestible than kibble, and his new study in dogs strengthens those findings.

Journal Reference:

The article, "Nutrient digestibility and fecal characteristics, microbiota, and metabolites in dogs fed human-grade foods," is published in Journal of Animal Science [DOI: 10.1093/jas/skab028]. Authors include Sungho Do, Thunyaporn Phungviwatnikul, Maria de Godoy, and Kelly Swanson. Funding was provided by JustFoodForDogs LLC.
The Department of Animal Sciences and the Division of Nutritional Sciences are in the College of Agricultural, Consumer and Environmental Sciences at the University of Illinois.

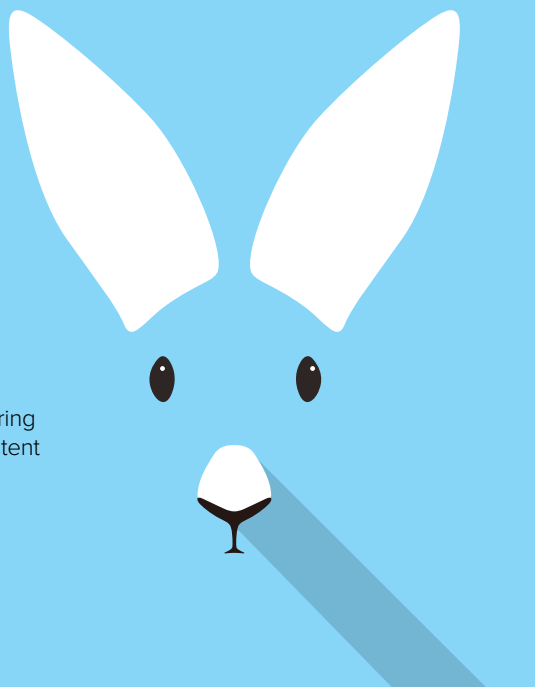
GENE REQUIRED FOR JUMPING IDENTIFIED IN RABBITS

Rabbits and other hopping animals require a functional RORB gene to move around by jumping, according to a new study by Miguel Carneiro of the Universidade do Porto and Leif Andersson of Uppsala University published March 25th in PLOS Genetics.

Rabbits, hares, kangaroos and some rodent species all travel by jumping, but this type of movement is not well understood on a molecular and genetic level. In the new paper, researchers investigated jumping-related genes using an unusual breed of domesticated rabbit called the sauteur d'Alfort. Instead of hopping, it has a strange gait where it lifts its back legs and walks on its front paws. By breeding sauteur d'Alfort rabbits with another breed and comparing the offspring's genomes and jumping abilities, the researchers identified the cause of this developmental defect. They identified a specific mutation in the RAR related orphan receptor B (RORB) gene. Typically, the RORB protein is found in many regions of the rabbit nervous system, but the mutation leads to a sharp decrease in the number of neurons in the spinal cord that produce RORB. This change is responsible for the sauteur d'Alfort's weird walk.

The new study demonstrates that a functional RORB gene is necessary for rabbits and likely other hopping animals to perform their characteristic jumping gait. The findings build on previous studies in mice, showing that animals that lack the RORB gene had a duck-like walk. Additionally, this work advances our understanding of the different ways that animals with backbones move.

"This study provides a rare example of an abnormal gait behavior mapped to a single base change and the first description of a gene required for saltatorial locomotion," the authors conclude. "It further demonstrates the importance of the RORB protein for the normal wiring of the spinal cord, consistent with previous studies in mouse."



NEW IMPROVED DOG REFERENCE GENOME WILL AID A NEW GENERATION OF INVESTIGATION

Researchers at Uppsala University and the Swedish University of Agricultural Sciences have used new methods for DNA sequencing and annotation to build a new, and more complete, dog reference genome. This tool will serve as the foundation for a new era of research, helping scientists to better understand the link between DNA and disease, in dogs and in their human friends. The research is presented in the journal Communications Biology.

The dog has been aiding our understanding of the human genome since both genomes were released in the early 2000s. At that time, a comparison of both genomes, and two others, revealed that the human genome contained circa 20,000 genes, down from the around 100,000 predicted earlier. In the new study, researchers led by Dr Jennifer Meadows and Professor Kerstin Lindblad-Toh, have greatly improved the dog genome, identifying missing genes and highlighting regions of the genome that regulate when these genes are on or off.

A key factor was the move from short- to long-read technology, reducing the number of genome gaps from over 23,000 to a mere 585.

“We can think of the genome as a book,” says Meadows. “In the previous assembly, many words and sometimes whole sentences were in the wrong order or even missing. Long-read technology allowed us to read whole paragraphs at once, greatly improving our comprehension of the genome.”

“Additional tools which measure the DNA’s 3D structure allowed us to place the paragraphs in order,” adds Dr Chao Wang, first author of the study.

A better reference genome also helps disease research. Domestic dogs have lived alongside humans for tens of thousands of years and suffer from similar diseases to humans, including neurological and immunological diseases as well as cancer. Studying dog disease genetics can provide precise clues to the causes of corresponding human diseases.

“The improved canine genome assembly will be of great importance and use in canine comparative medicine, where we study diseases in dogs, for example osteosarcoma, systemic lupus erythematosus (SLE) and amyotrophic lateral sclerosis (ALS), with the goal of helping both canine and human health,” says Lindblad-Toh.

THE ABCS OF VETERINARY DENTISTRY: D IS FOR DENTIGEROUS CYST

DR DAVID E CLARKE BVSC DIPLOMATE AVDC FELLOW AVD - REGISTERED SPECIALIST, VETERINARY DENTISTRY AND ORAL SURGERY | TRACEY SMALL BA (SOC SC), VN, DIP VN (DENTISTRY) WWW.DENTALCAREFORPETS.COM.AU

IN THIS ARTICLE WE CONTINUE OUR JOURNEY THROUGH THE ALPHABET LOOKING AT THE LETTER D.

Odontogenic cysts are epithelium lined structures that occur in the areas of the jaws containing teeth.1-3 Uncommon in dogs, they have been reported to include dentigerous cysts, periapical (or radicular) cysts, lateral periodontal cysts, odontogenic keratocysts and canine odontogenic parakeratinised cysts.1,3-6 Odontogenic cysts arise within islands of remnants of odontogenic epithelium (dental lamina, rests of Malassez) located in the periodontal ligament stroma.1

Dentigerous cysts are the most common odontogenic cysts in dogs.1,3,6-10

During odontogenesis, once the enamel has been formed, the enamel organ atrophies and becomes the reduced enamel epithelium.11,12 The reduced enamel epithelium is a closed sac that encompasses the crown of the tooth and is attached at the cemento-enamel junction (CEJ).11-13 When the tooth erupts through the gingiva, the enamel epithelium desquamates to form a ring of tissue around the CEJ and becomes part of the gingival attachment and is no longer a closed sac.6,12

When a tooth fails to erupt, the reduced enamel epithelium remains a closed sac around the crown of the tooth and fluid is drawn in by a process of osmosis resulting in a cyst.12,14 The cyst forms when fluid accumulates within the cyst lining consisting of epithelial cells derived from the reduced enamel epithelium.11,14 This cyst continues to expand compromising and destroying local bone, adjacent teeth and resorption of roots.11-15 Dentigerous cysts are therefore associated with unerupted teeth.11-15 Dentigerous cysts are usually painless, however, the fluid accumulation and proliferation of epithelial cells often cause local destruction to bone and adjacent teeth.11,12

Case study

Tilkah, an 18 month old, 15.5kg, spayed female Blue Heeler dog **(Figure 1)** was treated for a dentigerous cyst. She was originally referred to the practice at eight weeks of age with a Class 2 malocclusion that also involved bilateral malposition of the mandibular deciduous canine teeth (704, 804). 704 was positioned distal to 604 and 804 was linguoverted and traumatising the hard palate on the palatal aspect of 504. At the initial visit, the displaced

Figure 1

teeth were causing significant pain and possibly causing a dental interlock preventing normal elongation of the mandible. Treatment involved extraction of 704 and 804 to relieve the trauma and allow the jaw to grow in length if the malocclusion was not of genetic origin. The recommended revisit time was six months of age for review of the erupting permanent mandibular canine teeth, but due to family restrictions Tilkah returned for an occlusion assessment at 12 months of age. On conscious examination it was noted that the mandible had not elongated, the left mandibular canine tooth (304) had erupted into an atraumatic position caudal to the left maxillary canine tooth (204), and the mandibular right canine tooth (404) was linguoverted causing trauma to the hard palate. In addition, it was noted that the mandibular right first premolar (405) was not visible on probing and charting. Treatment options for 404 included tooth extraction, crown amputation and direct pulp capping, or orthodontic movement were discussed with the owner, who chose crown reduction and pulp capping. Tilkah was then admitted for treatment of 404 to alleviate

trauma to the hard palate and to radiograph the presumed absent 405. Pre-anaesthetic blood chemistry and haematology profile were within normal limits. A 22 gauge intravenous catheter was placed in the right cephalic vein aseptically and a balanced electrolyte solution Hartmans™ 2.5ml/kg/hr commenced. A preanaesthetic of acepromazine 0.4mg, buprenorphine 150ug and atropine 0.84mg was given by subcutaneous injection. Tilkah was induced with diazepam 4mg and ketamine 80mg via IV catheter 30 minutes later. Anaesthesia was maintained via #8 cuffed endotracheal tube using 1.5 - 3% isoflurane in oxygen. Anaesthetic monitoring included visual assessment, reflex activity, oxygen saturation, heart rate, expired CO2, respiratory rate and blood pressure. These parameters were recorded every five minutes on an anaesthetic monitoring form. IV fluids were increased to 5ml/kg/hr (77ml) throughout the surgery procedure. Tilkah was placed into right lateral recumbency and a warming blanket was placed over her to maintain body temperature.

Once Tilkah was stabilised a comprehensive oral examination was performed by the veterinary dental specialist and nurse. Overall teeth were healthy, no gingivitis was present, some generalised calculus was recorded, tooth 404 was linguoverted and tooth 405 appeared missing **(Figure 2).** Dental radiographs were taken with a size 2 Sopix digital DR sensor plate.


Figure 2

Radiographs of 405 **(Figure 3)** revealed an unerupted tooth with no significant radiographic changes to the surrounding area and displacement of the crown in a coronal/distal direction and the root was tipped distally. Based on these findings a tentative diagnosis of a dentigerous cyst was made. The crown amputation and direct pulp capping were performed successfully, but due to anaesthetic considerations, a decision to extract 405 in four months when Tilkah would return for radiographs of the crown amputation and vital pulp therapy of 404 to assess tooth vitality was made and the owner informed.


Figure 3

Tilkah returned four months later for assessment and treatment of the unerupted 405 and to radiograph the vital pulp therapy of 404. Tilkah was found to be in good health and well hydrated. Anaesthesia was performed as previously described.

The patient was placed into left lateral recumbency. A local nerve block using 0.3mls of 3% mepivacaine into the mandibular right middle mental foremen using a dental aspirating syringe and carpule was performed, which blocks the inferior alveolar nerve, thereby anesthetizing the mandibular incisors and canine. Mepivacaine takes affect within two minutes and lasts for approximately 2-3 hours. A radiograph of the previous crown amputation and direct pulp capping showed a formed dentinal bridge and narrowing of the pulp canal, indicative of treatment success and tooth vitality. A radiograph of the impacted 405 **(Figure 4)** showed an enlargement of the lesion and some alveolar bone loss associated with the distal aspect of 404.

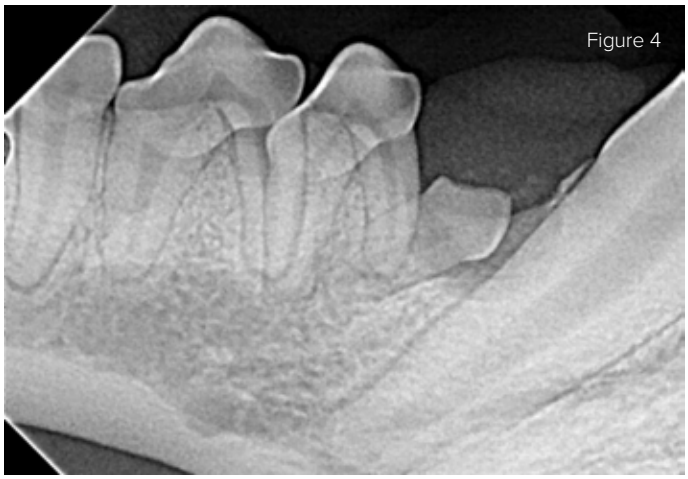


Figure 4

A size 15 surgical blade was used to make an incision into the gingiva over the normal position of 405 extending from the mesial aspect of 406 to the distal aspect of 404. A No 2 Molt periosteal elevator was then used to elevate an envelope flap to expose the underlying area.

The flap was retracted with a Minnesota retractor to visualise the impacted tooth **(Figure 5)**.

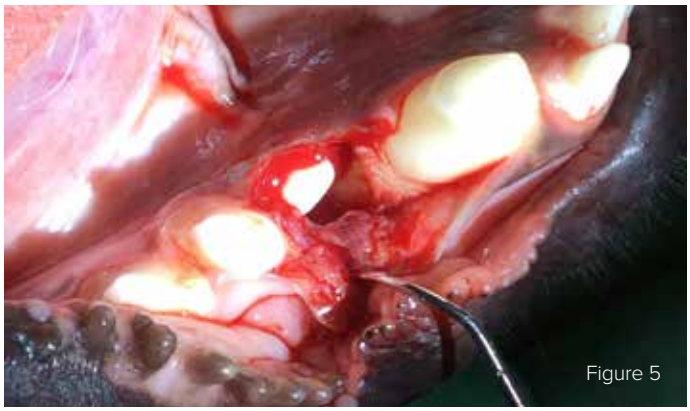


Figure 5

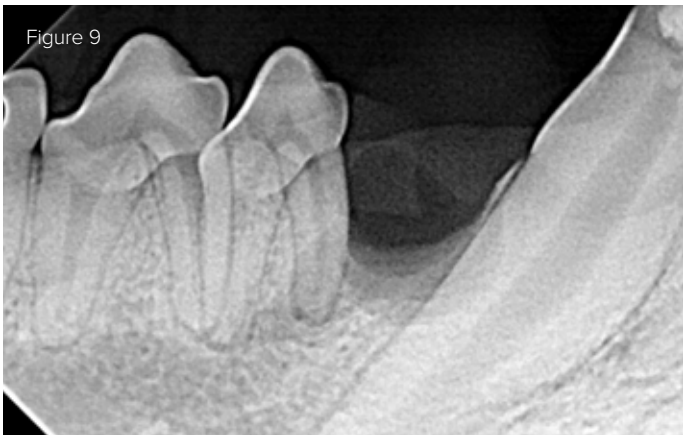

Figure 6

A No. 2 winged Cislak dental elevator was used to sever the periodontal ligament supporting 405 which had a portion of the soft tissue (presumed to be a dentigerous cyst lining) attached to the CEJ **(Figure 6)**.

The 405 with attached epithelial tissue was extracted with extraction forceps **(Figure 7)** and placed into a formalin pot for histopathology at Gribbles Pathology. A post extraction radiograph showed there was alveolar bone resorption along the distal surface of 404 and the mesial surface of the mesial root of 406 where the epithelial lining was adhered to.

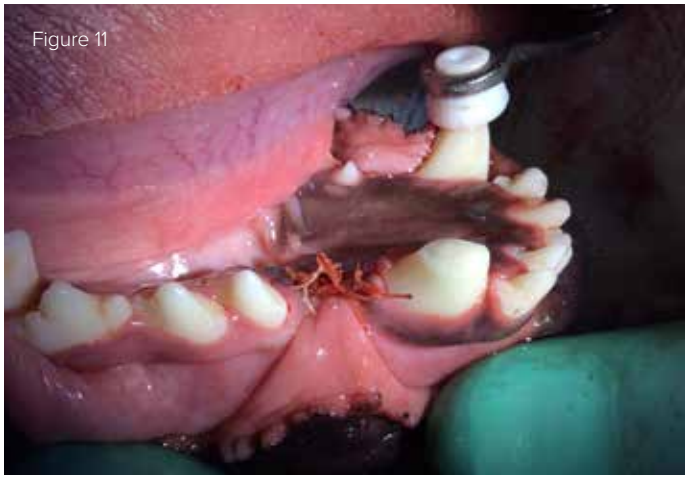
The epithelial cavity lining was debrided using a No 2 Molt periosteal elevator **(Figure 8)** and placed into a separate formalin pot for histopathology. The exposed root surfaces of 404 and 406 were curetted with a #5/6 Gracey curette.

A radiograph was taken to confirm complete extraction of 405 and debridement of the cavity **(Figure 9)**.



With confirmation of extraction of 405, the area was flushed and tricalcum phosphate was placed into the defect to the height of the alveolar bone and radiographed **(Figure 10)**.

The gingiva was sutured closed with polyglycolic acid absorbable suture size 3/0 **(Figure 11)**.



Tilkah was moved to a recovery cage. IV fluids were reduced to 2.5ml/kg/hr (38ml) for an hour. A subcutaneous injection of meloxicam 3mg for pain and inflammation was administered.

At discharge, the client was instructed to feed soft chunks of meat for the next 10 days and to prevent Tilkah from chewing on any hard objects to allow the extraction site to heal. Medications were explained, oral meloxicam to the 15.5kg dose mark once daily and clindamycin 150mg capsules twice daily for 10 days. Maxigard™ gel (chlorhexidine free zinc and Vitamin C formula) was advised to use daily by placing a pea sized drop on both upper canines for regular oral hygiene.

A revisit consultation was booked for two weeks time. The owners were contacted by phone two days post-surgery, Tilkah was recovering well with no complications. The histopathology report noted: Macroscopy – "Tooth 405 and cyst". A tooth with surrounding attached connective tissue and five tiny fragments of light tan non-descript tissue the largest of which measures 3mm x 1mm. The soft tissues from around the tooth are removed and placed into a single cassette with fragments of additional tissue and the tooth is placed into decalcification for further processing. Microscopy – Gingival cyst (multiple fragmented sections): The sections evaluated are fibrovascular connective tissue with multiple segments of the surface having an intact layer of stratified epithelial cells. The epithelial cells are well differentiated with no outstanding atypical features. In some areas the underlying connective tissue is consistent with granulation tissue and some segments have mild local active

inflammation composed of macrophages, lymphocytes, plasma cells and occasional neutrophils. The decalcified sections of tooth have no significant changes. Diagnosis - Gingival cyst: Dentigerous cyst. Comments – The gingival tissues provided are lined by stratified squamous epithelial cells with additional sections of a histologically normal tooth which is consistent with a dentigerous cyst. A diagnosis of dentigerous cyst was therefore confirmed by histopathology and the owners were informed of the result.


Figure 12

A revisit consultation two weeks post-surgery showed that the surgery site had healed, and sutures had dissolved **(Figure 12).** The owners were shown how to brush Tilkah's teeth and instructed to do so daily using the supplied Petosan toothbrush and toothpaste. An appointment was made for six months to radiograph the surgical site, to evaluate the success of enucleation of original cyst and to assess the health of bone structure and tooth vitality of 404 and 406.

At this revisit, the area had healed well **(Figure 13)** and radiographs confirmed successful regrowth of previously lost bone **(Figure 14).**


Figure 13

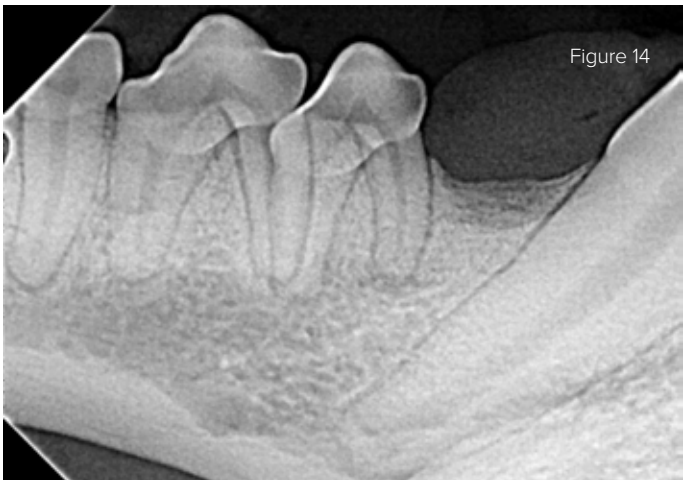


Figure 14

Conclusion

Dentigerous cysts should be a primary consideration for any oral swelling or missing tooth in either jaw.3,6,16,17 The most commonly represented breeds are the brachycephalics and the most common area is the first premolar in the mandible.3,17

Because dentigerous cysts are often discovered as an incidental finding, the significance of a thorough oral examination and radiographs of all presumed missing teeth cannot be over emphasised.3,6,17 Treatment involves a surgical approach using a mucogingival-periosteal flap to accomplish removal of the unerupted tooth, complete enucleation of the cyst wall, curettage, osteoplasty, and bone grafting if bone defects are extensive.3,6,16,17 In the many cases, a bone graft is not necessary, as a healthy blood clot using the host's own osteoblasts to replace bone lost is recommended. Prognosis is excellent when treated early and when the cyst is completely excised6,11,12,14,15 as early detection and treatment of dentigerous cysts prevents the continuation of local bone and tooth destruction.11,13-15 Histopathology of the epithelial lining is recommended.

It is recommended that follow up radiographs are performed six months later to confirm success of excision, to assess the regeneration of local bone, vitality of adjacent teeth, periodontal support and root resorption.6,11,13-15

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DUMPLING CRAZE HITS DOGGIES – GOBS OF DROOL TO BE EXPECTED!

Who doesn't love dumplings? Even our dogs will love to eat one (or two), and now they can with Bowie Drools Over Dumplings – delicious dog-friendly dumpling ideas and recipes for your furry best friend – all tried and tested, and drooled over by Bowie the Labrador.

Bowie's human mama and avid home chef Riesa Renata combined her passion for cooking and love for dogs and their nutritional health to create delightful dumpling ideas and super-tasty recipes for every dog and his human!

"I know Bowie loves a recipe more than others by the amount of drool he produces; that's why the book is titled Bowie Drools. It's his unique feature!" laughed Riesa.

Each recipe is also a visual rainbow masterpiece, as seen on Bowie's Instagram!

Bowie Drools Over Dumplings explores different types of dumplings around the world and adapts them for canine consumption with plenty of options to suit dogs' dietary needs. Readers can also learn the benefits of each ingredient and know what they feed their dogs.

Simply choose your preferred wrapper (classic flour and water, cheddar cheese or vegetarian), favourite filling (classic pork, cranberry Christmas turkey, BBQ beef brisket, spring lamb and more!) and the shape of your dumpling. Then "jazz it up" with easy home-cooked bone broth, superfood seeds or your dog's favourite meal topper if you wish. Don't forget dessert dumplings for sweet-tooth pooches! (Go ahead, feed that first!)

"I'm big on variety and feeding in rotation. I also love the idea of eating the rainbow – for humans and for dogs. It's about making eating fun (and healthy!)," said Riesa. "You don't need to be a qualified chef to cook the recipes at home – everyone can do it!"

Riesa's cooking journey began in her Melbourne home kitchen during the pandemic lockdown last year. Bowie's delectable meals have inspired many social media followers to create 'fancy' meals for their own dogs. Riesa created cheddar cheese wrapped dumplings (possibly Riesa's invention!) which then inspired her to write Bowie Drools Over Dumplings.

Born and raised in Indonesia, she grew up eating different types of Chinese dumplings. When she began researching for the book, she discovered other cuisines had their own version of dumplings, such as the Turkish Manti, Japanese Gyoza and South American Empanada.

"They all seem to share a similar trait that the dumplings represent the culture, tradition and a link to their family through food," said Riesa. "I love eating, cooking for and serving food to my family and friends, and it just seems natural to share what I love to eat and serve with Bowie.

"I love cooking for Bowie because I know what I'm feeding him and he's involved every step of the way, as the 'chief tester and taster' and quality control. For me, it's like a bonding session with Bowie," said Riesa.

Bowie during the live Instagram Book Launch – drooling away!

"Bowie Drools Over Dumplings is not a traditional recipe book where you just follow a recipe and that's it. It also gives you plenty of ideas and inspiration to create your own dumplings to suit your dog's needs. I'm a big advocate for that!"

Bowie Drools Over Dumplings is beautifully designed and crafted with original illustrations, letterpress detail on the cover and bespoke binding. It will make a great addition to your repertoire of treat recipes for your dog, and a perfect gift for any dog lovers.

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BIRD PARENTS THAT RECEIVE HELP LIVE LONGER

Long life is common among bird parents that get help with childcare. This finding comes from researchers at the universities of Lund and Oxford who reviewed data from more than 9,000 studies.

Being a parent can be tough. In general, animals that care for many offspring die young, at least in species where parents are not helped by others. However, in some species things are different and parents recruit 'helpers' to assist with childcare. In such group-living species, parents often produce lots of young and also live an exceptionally long time. This new research now shows that this happens because helpers reduce the burden of care on parents.

"A common pattern in group-living species is that parents do not care very much for their own young. Instead, the helpers are responsible for feeding and protecting the young and performing the other tasks that are usually associated with being a parent," says Philip Downing at Lund University.

The fact that the parents avoid this work-load means that they can reproduce again and again and still live a long time.

Some group-living species take this to the extreme with parents always relying on helpers for offspring care. For example, breeding individuals in ants, termites and naked mole rats live for many decades, producing thousands of offspring without ever caring for a single offspring. While these species are fascinating, it is impossible to tell if the secret to breeders living for such a long time is outsourcing parental care as all breeders have helpers.

Instead Philip Downing, his Lund colleague Charlie Cornwallis, and Ashleigh Griffin from Oxford University, focused their review on 23 bird species where some parents get help raising their young, while other parents take care of their young on their own. Such species occur throughout the world and include long-tailed tits in Sweden, sociable weavers in Southern Africa and the Seychelles warbler that occurs on a few islands in the Indian Ocean.

"It is within these 23 species that we see clear differences in longevity. Parents who get help with caring for young live, on average, one to two years longer than parents who don't. This may not sound like a lot, but in human terms it equates to about six and a half glorious years," says Charlie Cornwallis.

However, the researchers add a twist: Not all helpers take their job seriously. If the helpers are lazy, parents are forced into putting more effort into raising their young, something that shortens their lives.

So what is the secret behind living a long time and having many offspring at the same time? Philip Downing has the answer:

"As a parent, make sure you have hard-working helpers."

Journal Reference:

Philip A. Downing, Ashleigh S. Griffin, Charlie K. Cornwallis. Hard-working helpers contribute to long breeder lifespans in cooperative birds. Philosophical Transactions of the Royal Society B: Biological Sciences, 2021; 376 (1823): 20190742 DOI: 10.1098/rstb.2019.0742

PAW HYGIENE NO REASON TO BAN ASSISTANCE DOGS FROM HOSPITALS

Over 10,000 people in Europe use an assistance dog; think of guide dogs for people with a visual impairment, hearing dogs for people with a hearing impairment, medical response service dogs and psychiatric service dogs.

According to a UN-agreement and the Dutch law, these dogs are welcome in stores, hospitals and other public places. However, in practice, many assistance dog users and their dogs are regularly refused entry. In the Netherlands, four out of five assistance dog users indicate that they regularly experience problems with this.

Often, hygiene reasons are given as the main argument for refusing entry to assistance dogs. Research by Utrecht University now shows that the paws of assistance dogs are cleaner than the shoe soles of their users, and thus, paw hygiene is no reason to ban assistance dogs from hospitals.

To investigate this, Jasmijn Vos, Joris Wijnker and Paul Overgaauw of Utrecht University's Faculty of Veterinary Medicine took samples from the paws of 25 assistance dogs and the shoe soles of their users. For comparison, they also investigated an equally large group of pet dogs and their owners. Vos and her colleagues examined the samples for poop bacteria (Enterobacteriaceae), which are very common outdoors, and for an important diarrheal bacteria (Clostridium difficile).

"The dogs' paws turned out to be cleaner than the soles of their shoes," says Jasmijn Vos, Masters student at Utrecht University. "This makes the hygiene argument that is often used to ban assistance dogs from public locations invalid." Moreover, the diarrheal bacteria did not occur on the dogs' paws whatsoever, and only once on a shoe sole.

81% of assistance dogs are refused

Dutch assistance dog users were also surveyed about their experiences. 81% are still regularly refused entry to public places with their dog, even though this is prohibited by law. This is mainly down to lack of knowledge on the part of the person refusing entry: lack of knowledge on what an assistance dog is, how it can be recognised, and about the rules of law.

The study also shows that assistance dog users constitute only a small fraction of the total number of patients in Dutch hospitals. Should they decide to bring their assistance dog to the hospital, or elsewhere, this should be made possible; assistance dogs are usually well trained and are no more of a hygiene hazard than people!

Journal Reference:

S. Jasmijn Vos, Joris J. Wijnker, Paul A. M. Overgaauw. A Pilot Study on the Contamination of Assistance Dogs' Paws and Their Users' Shoe Soles in Relation to Admittance to Hospitals and (In)Visible Disability. International Journal of Environmental Research and Public Health, 2021; 18 (2): 513 DOI: 10.3390/ijerph18020513

DOMESTICATION AND INDUSTRIALISATION LEAD TO SIMILAR CHANGES IN GUT MICROBIOTA

Domestication has a consistent effect on the gut microbiota of animals and is similar to the effects of industrialisation in human populations, with ecological differences such as diet having a strong influence.

These findings, published today in eLife, highlight how the flexibility of the gut microbiota can help animals respond to ecological change and could help identify ways of manipulating gut microbial communities in the service of health.

Animals typically have complex communities of microbes living in their gut that can strongly influence functions such as immunity and metabolism. These communities can be extremely diverse and differ greatly between species and even individuals. We know, for instance, that domesticated animals, such as lab mice, have different gut microbial communities than their wild relatives. We have even seen large changes in the gut microbiota of industrialised human populations, some of which have been linked to the rise of certain diseases.

During domestication, animals experienced profound ecological changes that likely shaped their gut microbiota. “Domesticated animals and industrialised human populations potentially experienced similar ecological changes such as less diverse, more easily digestible diets, higher population densities, and more medical interventions,” explains first author Aspen Reese, who was a postdoctoral Junior Fellow in the Society of Fellows, Harvard University, US, at the time the study was carried out, and is now Assistant Professor at the University of California, San Diego, US. “We wanted to find out if domestication had consistent effects on the gut microbiota of animals and if the effects were indeed similar to those of industrialisation in humans.”

To assess the effects of domestication, the team sequenced and compared microbial DNA extracted from fecal samples of 18 species of wild and domesticated mammals. They found that domestication did have a clear global effect on gut microbiota, although the specific differences depended on the species.

Domestication involves strong selection pressure on animals, leading to important genetic and physiological changes that may also affect gut microbial communities. To unpack the relative roles of ecology and genetics, the team then swapped the diets of wild and domesticated animals. They found that the gut microbial communities of related animals, such as wolves and dogs, became much more similar to one another, supporting the idea that altered diets explain at least some of the changes in the gut microbiota seen with domestication.

To understand whether such differences also occur in humans, they then compared the gut microbial communities of humans to those of chimpanzees, one of our closest living relatives, and between humans living in industrialised versus non-industrialised populations. They found that differences between the gut microbiota of humans and chimpanzees were similar to those seen between domesticated and wild animals, with the largest changes evident in industrialised populations. Because all humans are equally related to chimpanzees, these results showed that ecological factors rather than genetics drive aspects of the gut microbiota shared between domesticated animals and humans living in industrialised populations.

“Our research highlights that the flexibility of the gut microbiota likely helps animals and humans respond to rapid ecological change,” concludes senior author Rachel Carmody, Assistant Professor in the Department of Human Evolutionary Biology at Harvard University.

“But, at the same time, this flexibility can create opportunities for mismatch between the gut microbiota we have and the one our bodies have evolved to expect. As we increasingly appreciate the central role of the gut microbiota in biology, understanding the factors that shape it in animals and humans may help us identify new ways to improve experimental animal models, the wellbeing of animals we depend on, and ultimately, human health.”

DOGS INFECTED WITH LEISHMANIA PARASITES SMELL MORE ATTRACTIVE TO FEMALE SAND FLIES

Dogs infected with the Leishmania parasite smell more attractive to female sand flies than males, say researchers.

The study published in PLOS Pathogens is led by Professor Gordon Hamilton of Lancaster University.

In Brazil, the parasite Leishmania infantum is transmitted by the bite of infected female Lutzomyia longipalpis sand flies.

Globally over 350 million people are at risk of leishmaniasis, with up to 300,000 new cases annually. In Brazil alone there are approximately 4,500 deaths each year from the visceral form of the disease and children under 15 years old are more likely to be affected.

Leishmania parasites are transmitted from infected dogs to people by sand flies when they bite. Visceral leishmaniasis affects the internal organs and is fatal if not treated.

As only female sand flies transmit the parasite, researchers wanted to understand if infection made dogs more attractive to the insect.

Professor Gordon Hamilton of Lancaster University said: "In this study we showed that infected dog odour is much more attractive than uninfected dog odour to the female sand flies. Only the females can transmit the pathogen and male sand flies, which do not transmit the parasite, are not affected by the changed odour.

"This clear-cut difference in attraction of female and male sand flies suggests that the females are preferentially attracted by parasite infected hosts and this could lead to enhanced infection and transmission opportunities for the parasite."

The researchers had previously found that dogs infected with Leishmania parasites smelled different compared to uninfected dogs.

Professor Hamilton said: "Domestic dogs are the reservoir of infection, therefore understanding how the infection affects the attractiveness of dogs to the insect vector is important in understanding the epidemiology of the disease and offers opportunities for new control and diagnostic methodologies."

Journal Reference:

Monica E. Staniek, James G. C. Hamilton. Odour of domestic dogs infected with Leishmania infantum is attractive to female but not male sand flies: Evidence for parasite manipulation. PLOS Pathogens, 2021; 17 (3): e1009354 DOI: 10.1371/journal.ppat.1009354

NEW WARNINGS ABOUT TICKS TRANSMITTING DEADLY DISEASE TO DOGS IN AUSTRALIA

Ehrlichiosis is a deadly disease in dogs caused by the bite of a brown tick infected with an exotic pathogen Ehrlichia Canis (E.canis) and animal health authorities are on alert for it spreading to other parts of the country.

In May 2020, E.canis was detected in a small number of dogs in Western Australia's Kimberley region. This is the first detection of E.canis in dogs in Australia that had not been imported from overseas and is a notifiable disease, according to the NSW Department of Primary Industries. Animal health authorities are concerned that the tick-borne disease will soon hit other parts of the country.

Companion Animal Network Australia (CAN) National Executive Trish Ennis warned, "We have reports of confirmed cases of infected dogs in various parts of Australia, including Broome in Western Australia and the APY Lands in South Australia."

Although infected dogs do not directly transmit the disease to other dogs, the transmission occurs through infected ticks, particularly the brown dog tick which is widespread in mainland Australia.

"Investigations into the origin of the infection in both northern WA and the Northern Territory are ongoing with no obvious leads at this time, which means it's possible the disease has been present in some regions for some time," said Ms Ennis.

In early 2021, ticks infected with the bacteria that causes ehrlichiosis were also found in South Australia's far north.

Veterinarian Dr Julie Bellamy, CEO Animal Welfare League SA, said, "Ehrlichiosis is a very serious disease with a high mortality rate in chronically infected dogs. Infected animals require veterinary treatment and supportive care.

"Dog owners must be vigilant. There are a number of things you can do to help prevent this disease in your dogs, including placing your dog on a tick control program. Dog owners should consult with their veterinarians on the risk and preventative measures appropriate for their geographical area," she said.

The National Pest and Disease Outbreak website advises pet owners to inspect their dog daily for ticks, especially if they have been in a tick-infested area. Run your fingers through your dog's coat over their skin and feel for abnormal bumps, paying particular attention to the head and neck, inside their ears, on their chest, between their toes and around their mouths and gums.

The initial clinical signs of E.canis infection can include: fever, lethargy, enlarged lymph nodes, loss of appetite, discharge from the eyes and nose, weight loss and bleeding disorders. If your dog is showing any of the above clinical signs, please contact a vet immediately.

"We recommend you contact your veterinarian if you have a dog that is unwell because early treatment provides the best chance for them to recover," Dr Bellamy added.

A spokesperson from the Department of Primary Industries and Regional Development, WA advised, "In areas where brown dog ticks are present or dogs to be rehomed are sick, rehoming agencies are encouraged have dogs tested for E. canis before moving them to ensure they are not spreading the disease to another area. In Western Australia, movement conditions apply to dogs being moved out of the Kimberley, where the disease is established."

For more information, visit www.agric.wa.gov.au/ehrlichiosis. Ehrlichiosis is predominantly a disease of dogs but there have been rare cases of human infection. The Department of Health has information on their website about ticks and human health precautions.
For more information on the disease visit: www.outbreak.gov.au/current-responses-to-outbreaks/ehrlichiosis-dogs

Credit: Department of Primary Industries and Regional Development, WA

Credit: Christian Lambert on Unsplash

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NOVEL IMMUNOTHERAPY APPROACH TO TREAT CAT ALLERGY

Researchers from the Department of Infection and Immunity of the Luxembourg Institute of Health (LIH) brought forward the potential of high doses of a specific adjuvant molecule, namely CpG oligonucleotide, in successfully modulating the immune system's allergic response to the main cat allergen Fel d 1, thereby inducing a tolerance-promoting reaction and reverting the main hallmarks of cat allergy. The researchers analysed the molecular mechanisms underlying this tolerance and proposed a pre-clinical allergen-specific immunotherapy approach to improve the treatment and control of this common type of allergy. The full study results were published recently in the renowned international journal Allergy, the official journal of the European Academy of Allergy and Clinical Immunology (EAACI) and one of the top two journals worldwide in the allergy field.

Cat allergy is a rapidly increasing phenomenon characterised by an hypersensitivity and excessive immune response to certain allergens associated with felines, particularly Fel d 1, a protein typically found in their saliva, glands, skin and fur. Cat allergy manifestations can range from mild symptoms to the development of severe conditions such as rhinitis and asthma, with potentially fatal outcomes. While pharmacotherapy is an option for the milder forms, only allergen-specific immunotherapy (AIT) can ensure an effective and longer lasting treatment in the more advanced cases. AIT typically consists in the subcutaneous injection of gradually increasing quantities of the allergen in question, until a critical dose is reached that induces long-term immune tolerance. Nevertheless, there is still the need to improve cat AIT in terms of efficacy and safety. The researchers hypothesised that the most effective cat AIT could be achieved by optimising the response of immune system T- and B-cells through immune adjuvants to induce the production of antibodies against Fel d 1 while minimising inflammatory reactions, thereby boosting immune tolerance to this allergen.

"We sought to explore new means of increasing the anti-inflammatory activity of AIT with the known immunomodulatory adjuvant CpG, but at a higher safe dose than previously used for this type of therapy", explains Dr Cathy Léonard, scientist within the Allergy and Clinical Immunology research group at the LIH Department of Infection and Immunity and co-corresponding first author of the publication.

To study the cellular and clinical effects of an AIT based on the injection of the Fel d 1 allergen in combination with a high dose of CpG adjuvant, the team challenged Fel d 1-allergic mice with the allergen, both in the presence and absence of AIT. The scientists observed that AIT-treated allergic mice showed a significantly improved lung resistance, similar to that of non-allergic control mice, when compared with untreated allergic mice, with signs of airway inflammation and hyper-responsiveness being considerably reduced. Indeed, when looking at the Fel d 1-specific antibodies, the team noticed that AIT-treated allergic mice displayed lower levels of IgE, which are commonly associated with allergic responses, and higher levels of IgA and IgG, which can have anti-inflammatory properties. In addition, AIT-treated allergic mice showed a reduction in the levels of certain pro-allergic cytokine molecules, produced by type 2 helper T cells (Th2), compared to untreated allergic animals. The researchers also noticed that, already very soon after AIT-injection, there was an increase in the tissues of AIT-treated mice in the abundance of immune cell types involved in allergy regulation and tolerance, namely plasmacytoid dendritic cells (pDCs), Natural Killer cells (NKs), regulatory T cells (T-regs) and regulatory B cells (B-regs). These cells were found to express higher levels of the Tumour Necrosis Factor alpha (TNF-a) receptor 2 (TNFR-2), with NK cells also producing the TNF-a cytokine, which are known to play a role in suppressing the allergen-specific immune response, thereby allowing these regulatory cells to act as a 'brake' on the immune system.

"At a later stage, we observed a clear increase of TNF-a in the lungs. Interestingly, AIT also triggered the appearance of a novel and unique type of Tregs, known as biTregs, which is even better equipped to counterbalance the allergic and inflammatory reaction in response to the antigen", adds Dr Léonard.

Collectively, these findings point towards the strong anti-inflammatory and anti-allergic effect induced by AIT with a high and safe dose of CpG adjuvant. Quite strikingly, however, the researchers found that the mechanism underlying this allergy-protective action varies according to whether the treatment is administered as a vaccine to mice that had never previously been exposed to the Fel d 1 antigen, and which therefore did not present an existing allergic state, or under already established allergic conditions, as is the case in AIT. The elucidation of these alternative pathways opens up new insights for the future design of preventive and curative allergy vaccines using CpG adjuvant.

Going further in the translation of these findings into applications for the pre-clinical setting, the scientists developed a delivery system based on the subcutaneous injection of the Fel d 1/ CpG treatment, as opposed to the more invasive intraperitoneal administration route. The results equally demonstrated the reversal of all allergy hallmarks and confirmed the anti-allergic effects of the AIT.

"In essence, we propose a pre-clinical model of AIT for cat allergy, which mimics the conditions required for human AIT clinical trials and which is already optimised for future use in translational studies. Indeed, our study presents several novelties including the use of endotoxin-free Fel d 1 allergen, which is mandatory in the clinical setting, to prevent the onset of collateral inflammatory responses which could compromise the desired induction of the tolerance-promoting mechanisms. Moreover, we show for the first time that the use of the maximum dose of CpG tolerated in humans has the ability to modulate the allergic response when combined with Fel d 1 allergen, with very favourable safety profiles and through a well-established and medically-approved delivery mode. Based on our data, we believe that CpG deserves reconsideration as an effective AIT adjuvant in humans and that our work sets the bases for the development of novel successful immunotherapeutic treatments for allergies", concludes Prof Markus Ollert, Director of the LIH Department of Infection and Immunity and senior lead author of the study.

NEW STRAIN OF DEADLY HENDRA VIRUS (HEV) DISCOVERED

The Australian veterinarian-led research project, 'Horses as Sentinels,' has identified a new strain of the deadly Hendra virus as the cause of a previously unexplained horse death in September 2015.

Hendra virus is highly lethal in both horses and humans, with mortality rates approximately 79% and 60% respectively. The originally recognised strain of Hendra virus has resulted in the deaths of four humans and over 100 horses in Australia, since 1994.

The newly recognised variant has not been detected previously by routine biosecurity testing in horses. In addition, the new strain has been detected in grey-headed flying fox samples from Adelaide in 2013 and it shares ~99% sequence identity with the 2015 horse case strain. Partial sequences of the variant have also been detected in flying foxes in other states. Grey-headed flying foxes migrate and their range includes parts of southern Australia, which previous advice classed as low risk – with some interpreting this to mean negligible risk of Hendra virus spillover. Up until now, the original strain of Hendra virus has only been known to occur within the range of black flying foxes and spectacled flying foxes.

The 'Horses as Sentinels' research team has developed updated diagnostic laboratory techniques capable of identifying the new strain, and will be sharing them with relevant laboratories. They have also established that the current Hendra virus horse vaccine is expected to be equally effective against the new strain.

The research team have alerted Chief Veterinary Officers and the Chief Health Officers are being informed. All members of the Australian Veterinary Association have also been alerted to the implications of this discovery for both human and animal health.

Significance for Veterinarians and Horse Owners

The finding indicates that HeV should be considered as a differential diagnosis in unvaccinated horses anywhere in Australia that flying foxes are present, and that unwell, suspect horses which return an initial negative Hendra virus test should continue to be treated with the same caution as a Hendra virus positive case, until testing for the new variant is performed.

There are a number of measures that people who work closely with horses can take to reduce the risk of infection with HeV and other viruses, such as vaccination, good biosecurity, use of personal protective equipment and good hygiene. These protocols are explained on State Government and the Australian Veterinary Association websites. Now is the time for Veterinarians, horse owners and handlers to review their Hendra virus management plans.

Background

Hendra virus was first identified in 1994 when racehorse trainer Vic Rail died after suffering a mysterious pneumonia like illness when 20 racehorses in Hendra, Queensland, also died. Subsequently, a previously-unknown virus was identified as the cause of both the trainer's and the horses' deaths. The attending veterinarian was Dr Peter Reid. Nineteen years later, Dr Reid reached out to Dr Annand – a veterinarian involved in the discovery of Australian bat lyssavirus in horses in 2013. The pair shared an interest in previously undetected zoonotic disease spillover, and teamed up with Dr Ina Smith of CSIRO's Risk Evaluation and Preparedness Program to launch the 'Horses as Sentinels' project.

The research team now also includes collaborators from The Westmead Institute for Medical Research, The University of Sydney; Sydney Medical School; The Sydney School of Veterinary Science; CSIRO's Health and Biosecurity; Queensland Department of Agriculture and Fisheries - Biosecurity Sciences Laboratory; Department of Agriculture Water and the Environment; and leading international scientists in this field in the United States.

It is important to note that some species of flying foxes are protected. Flying foxes play a critical role in our environment through the pollination of our native trees and the spreading of seeds. Without flying foxes, our eucalypt forests and rainforests would cease to exist. Interaction between domestic animals and flying foxes can be exacerbated by pressure on flying fox populations, for instance through loss of natural forest habitat forcing flying foxes to seek urban and peri-urban food sources.

Journal Reference:

The Australian Veterinary Association (AVA) is the only national association representing veterinarians in Australia. Founded in 1921, the AVA today represents 9000 members working in all areas of animal science, health, and welfare.

DIABETES IS ON THE RISE AMONG CATS AND DOGS

MORE THAN 2,000 VETERINARIANS FROM AROUND THE WORLD GATHER TO LEARN THE LATEST IN DIAGNOSIS AND TREATMENT AT NAVC'S VIRTUAL DIABETES SUMMIT MARCH 16

ORLANDO, FL – March 11, 2021 – Diabetes is rising faster in pets than in humans, with more than half a million cats and dogs diagnosed with diabetes each year. Learning important clinical signs of diabetes and how to design a treatment plan that's best for each cat or dog will be the focus of a virtual global summit hosted by the North American Veterinary Community (NAVC) March 16. More than 2,000 veterinarians from around the world are planning to attend the virtual event where they can take what they learn back to their clinics and put into practice to enhance and prolong the lives of cats and dogs everywhere.

Cynthia Ward, VMD, PhD, DACVIM (SAIM), internist, reproductive endocrinology specialist, and Professor Emerita at the University of Georgia will present a comprehensive look into diabetes in dogs and cats including diagnosis, patient considerations when designing a treatment plan and monitoring techniques. Boehringer Ingelheim is sponsoring the NAVC Virtual Diabetes Summit, which is free for all veterinary professionals who wish to attend.

"Throughout my career, I have studied diabetes. I am so excited to share my learnings and experiences with thousands of veterinarians so they are better equipped and more knowledgeable on how to diagnose and treat this disease," said Dr. Ward.

"Diabetes can be managed through a careful routine of diet, exercise and insulin injections. Treatment can be challenging since each animal's response varies so we will look at many different ways to develop individualized treatment plans."

Dr. Dana Varble, NAVC Chief Veterinary Officer, will host the summit and offers the following information for pet parents and veterinarians to recognize the most common signs of diabetes and treatment options.

Signs to look for:

- Increased appetite
- Weight loss
- Excessive thirst and increased water drinking
- Urinates frequently or begins having accidents in the house
- Cloudy eyes (dogs only)
- Decreased energy or fatigue
- Decreased appetite
- Increased or recurring infections

Management and Treatment:

- With obesity being a leading cause of feline diabetes, regular exercise, dietary changes and feeding routines are essential to maintaining weight
- Regular glucose monitoring
- Frequent visits to your veterinarian to assess your pet's condition and recommend treatment modifications
- Explore new innovations in diabetes management and monitoring allowing veterinarians and pet owners to work together as a team
- Minimize instances of stressful situations
- Be aware of and treat other diseases and infections your pet may have

"Diabetes in animals is very similar to the disease we see in humans, and just like with people, your pet's diabetes is also manageable. With time, proper care and dedication to a daily routine, your pet can live a quality, happy life," said Dr. Varble. "Left untreated, the effects of diabetes are life-threatening, which is why it is so important for pet parents to identify potential symptoms early and contact their veterinarian with any concerns regarding their animal's health."

The NAVC Virtual Diabetes Summit is part of the NAVC's new, interactive year-round virtual learning events including summits, seminars and a live webinar series.
Participating veterinarians will earn three hours of continuing education. For more information and to register, visit https://www.vetfolio.com/pages/navcvirtualsummit.

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> *-Dr. Anthony Caiafa*
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ESSENTIAL OILS MAY HELP GUT HEALTH OF NEW-AGE CHICKS

Popular native Australian essential oils including tea tree oil and eucalyptus are being studied to determine if they better equip chicken embryos and hatchlings to fight disease.

University of Queensland researchers are investigating the benefits of essential oils for animal welfare, productivity and sustainability in the Australian chicken meat industry.

Professor Eugeni Roura from UQ's Queensland Alliance for Agriculture and Food Innovation said essential oils, which have pathogen-fighting properties, were being introduced into the diet of breeder chickens.

"We're determining if important essential oil compounds transfer through to the egg, and if they do, are they providing any significant benefit for the embryos' health and robustness," Professor Roura said.

"The most critical period in a broiler chick's life is the first hours after hatching.

"This is when the young bird is more susceptible to environmental pathogens, yet its defences and its natural gut microflora are not well established."

The research team, including project leaders Dr Marta Navarro and Dr Shahram Niknafs, is trialling Australian native essential oils including tea tree oil, lemon myrtle, nerolina, niaouli, lemon myrtle, anise myrtle, eucalyptus and Tasmanian native pepper.

"These native oils have reported strong antioxidant or disease-fighting attributes and have been extensively studied here at UQ," Dr Navarro said.

"This study is aiming to develop a nutritional program to minimise disease in chicks to enhance productivity and sustainability."

She said essential oils could affect how bacteria communicated and spread, inhibiting the formation of bacterial biofilms as an example.

"This may open new possibilities to target non-desirable populations of bacteria in the chick's gut while it is still in the egg," Dr Navarro said.

"Also, the oils can stimulate appetite and digestion to promote strong and vigorous early growth and development."

In a 'chicken or the egg' scenario, another strategy being tested involves injecting essential oils and nutrients into fertile eggs using in-ovo injection technology.

The researchers are measuring multiple parameters and indicators of gut health during trials including microbiome composition, growth, overall embryo development, and the stage of development following fertilisation.

"Once hatched, we're measuring the chick's growth and performance during the first 10-15 days of its life," Dr Navarro said.

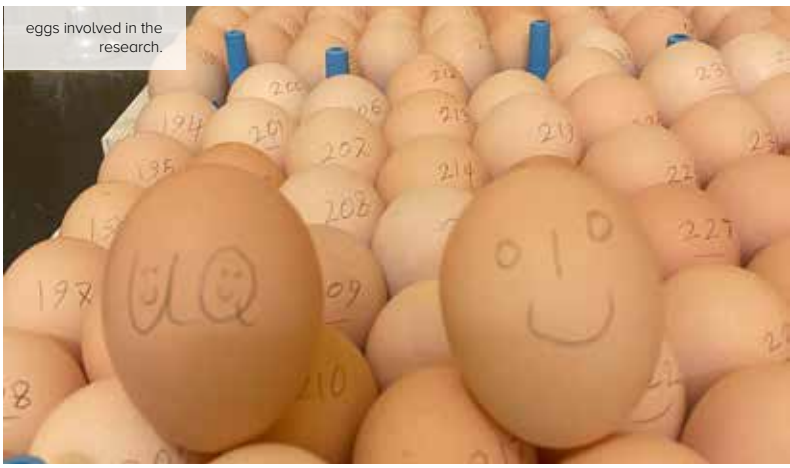
"At the end of the project, we'll perform a trial with all the knowledge acquired during the project in commercial conditions."

This project is funded by AgriFutures Chicken Meat Program and supported by the Queensland Department of Agriculture and Fisheries and UQ.

Meat quality is not part of the scope of the project.

Images: above right - Dr Shahram Niknafs holding a chick; above left - eggs involved in the research.

Dr Shahram Niknafs holding a chick



eggs involved in the research.

ALTHOUGH NOT VENOMOUS, A MOUSE'S BITE HOLDS VENOMOUS POTENTIAL

We are not venomous, and neither are mice -- but within our genomes lurks that potential, suggest scientists from the Okinawa Institute of Science and Technology Graduate University (OIST) and the Australian National University.

Reporting this week in PNAS, the researchers found that the genetic foundation required for oral venom to evolve is present in both reptiles and mammals.

The study also provides the first concrete evidence of an underlying molecular link between venom glands in snakes and salivary glands in mammals.

"Venoms are a cocktail of proteins that animals have weaponised to immobilise and kill prey, as well as for self-defence," said first author, Agneesh Barua, a PhD student at OIST. "What's interesting about venom is that it has arisen in so many different animals: jellyfish, spiders, scorpions, snakes, and even some mammals. Although these animals evolved different ways to deliver venom, an oral system -- where venom is injected through a bite -- is one of the most common and well-studied."

But scientists are still zeroing in on the origin of oral venom. This latest research into snakes, a group of animals renowned and feared for their potent bite, now reveals oral venom's ancient foundation.

Previously, scientists have focused on the genes that code for the proteins that make up the toxic mixture. "However, many of the toxins currently found in venom were incorporated after the oral venom system was already established. We needed to look at the genes that were present before venom's origin, genes which enabled the rise of venom systems," Barua said.

So instead, the team searched for genes that work alongside and interact strongly with the venom genes. The scientists used venom glands collected from the Taiwan habu snake -- a pit viper found in Asia.

The researchers identified around 3,000 of these 'cooperating' genes and found that they played important roles in protecting the cells from stress caused by producing lots of proteins. The genes were also key in regulating protein modification and folding.

When proteins are made, the long chains of amino acids must fold together in a specific way. Just like a wrong fold when doing origami, one misstep prevents the protein from assuming the required shape needed for it to function properly. Misfolded proteins can also accumulate and damage cells.

"The role of these genes in the unfolded protein response pathway makes a lot of sense as venoms are complex mixtures of proteins. So to ensure you can manufacture all these proteins, you need a robust system in place to make sure the proteins are folded correctly so they can function effectively," explained Barua.

The researchers then looked at the genomes of other creatures across the animal kingdom, including mammals like dogs, chimpanzees and humans, and found that they contained their own versions of these genes.

When the team looked at the salivary gland tissues within mammals, they found that the genes had a similar pattern of activity to that seen in snake venom glands. The scientists therefore think that salivary glands in mammals and venom glands in snakes share an ancient functional core that has been maintained since the two lineages split hundreds of millions of years ago.

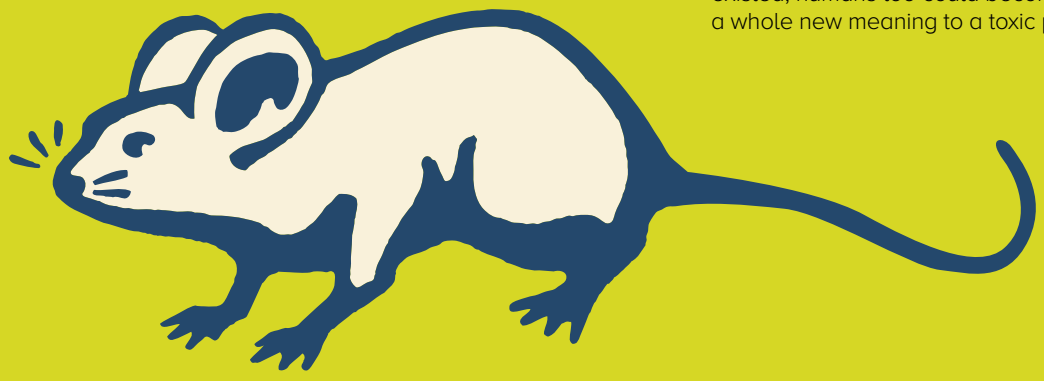
"Many scientists have intuitively believed this is true, but this is the first real solid evidence for the theory that venom glands evolved from early salivary glands," said Barua. "And while snakes then went crazy, incorporating many different toxins into their venom and increasing the number of genes involved in producing venom, mammals like shrews produce simpler venom that has a high similarity to saliva."

The apparent ease with which the function of salivary glands can be repurposed to be venomous is startling -- and could mean that scientists start looking at other mammals in an unsettling new light.

"There were experiments in the 1980s that showed that male mice produce compounds in their saliva that are highly toxic when injected into rats," said Barua. "If under certain ecological conditions, mice that produce more toxic proteins in their saliva have better reproductive success, then in a few thousand years, we might encounter venomous mice."

Whether mice are or are not on this evolutionary path is a matter that requires further investigation, but it certainly blurs the line between venomous and non-venomous species.

And although very unlikely, if the right ecological conditions ever existed, humans too could become venomous. "It definitely gives a whole new meaning to a toxic person," joked Barua.



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ANTIBIOTIC-RESISTANT STRAINS OF STAPH BACTERIA MAY BE SPREADING BETWEEN PIGS RAISED IN FACTORY FARMS

DNA sequencing of bacteria found in pigs and humans in rural eastern North Carolina, an area with concentrated industrial-scale pig-farming, suggests that multidrug-resistant Staphylococcus aureus strains are spreading between pigs, farmworkers, their families and community residents, and represents an emerging public health threat, according to a study led by researchers at the Johns Hopkins Bloomberg School of Public Health.

S. aureus is commonly found in soil and water, as well as on the skin and in the upper respiratory tract in pigs, other animals, and people. It can cause medical problems from minor skin infections to serious surgical wound infections, pneumonia, and the often-lethal blood-infection condition known as sepsis. The findings provide evidence that multidrug-resistant S. aureus strains are capable of spreading and possibly causing illness in and around factory farm communities in the U.S. -- a scenario the authors say researchers should continue to investigate.

The study was published online February 22 in Emerging Infectious Diseases, a journal published by the U.S. Centres for Disease Control and Prevention.

The researchers in recent years have been collecting samples of S. aureus from pigs, farmworkers, farmworkers' family members, and community residents -- including children -- in the top pig-producing counties in North Carolina. For the study, they sequenced the DNA from some of these samples to determine the relation of the strains found in pigs and people. They found that the strains were very closely related, providing evidence for transmission between pigs and people. Most of the strains carried genes conferring resistance to multiple antibiotics.

"We found that these livestock-associated S. aureus strains had many genes that confer resistance to antimicrobial drugs commonly used in the U.S. industrialised pig production system," says study first author Pranay Randad, PhD, a postdoctoral researcher in the Bloomberg School's Department of Environmental Health and Engineering.

"These findings warrant future investigations into the transmission dynamics in nearby communities and disease burden associated with these strains in the United States," says study senior author Christopher Heaney, PhD, associate professor in the same department. Epidemiologists have long suspected that S. aureus and other bacteria are transmitted from humans to pigs on factory farms, and thereafter evolve antibiotic resistance within the pigs. The animals are routinely given antibiotics to prevent outbreaks in their dense concentrations on factory farms. The drug-resistant bacterial strains may then be transmitted back to humans, becoming a potentially serious source of disease.

In recent years, Heaney and colleagues have been gathering S. aureus isolates from pigs and farmworkers at factory-scale pig farms in North Carolina, one of the leading pig-farming states. Their research has shown that livestock-associated strains of S. aureus, many of them antibiotic-resistant strains, can be found not only in pigs but also in farmworkers, their family members, and residents living nearby.

For the new study they performed whole-genome sequencing on 49 of these S. aureus isolates to characterise these strains at the DNA level and get a more precise picture of their interrelatedness.

One finding was that all these isolates, whether taken from humans or pigs, belonged to a grouping of S. aureus strains known as clonal complex 9 (CC9).

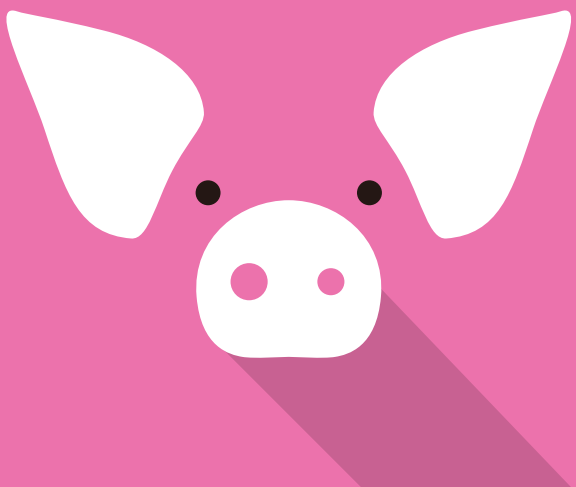
"This CC9 is a novel and emerging subpopulation of S. aureus that not many people have been studying, apart from a few reports in Asia," Randad says.

The researchers also determined from their analysis that the CC9 isolates from North Carolina were closely related, in many cases implying recent transmission between pigs and people. Moreover, virtually all of the isolates that appeared to be involved in transmission between pigs and humans were multidrug resistant, suggesting that diseases these isolates cause could be hard to treat.

The scope of the study didn't include evaluating S. aureus-related disease among people in the affected communities, but one of the pig farmworkers who carried a CC9 isolate in their nose reported a recent skin infection.

"In other countries, such as in Europe, we see a high level of coordinated research on this topic from a public health perspective, with open access to collect bacterial isolates from pigs raised on factory farms, but so far in the U.S. not as much is being done," Randad says.

Support for the study was provided by the Sherrilyn and Ken Fisher Centre for Environmental Infectious Diseases Discovery Program at the Johns Hopkins University School of Medicine; the GRACE Communications Foundation; the National Institute for Occupational Safety and Health, the National Science Foundation, the National Institute of Allergy and Infectious Diseases, and the National Institute of Environmental Health Sciences, among other funding sources.



‘WHAT IS THE PURPOSE OF THE VETERINARY PROFESSION IN MODERN SOCIETY?’

JOE BROWNLIE ARGUES THAT DEFINING ITS NATIONAL PUBLIC SERVICE ROLE IS ONE OF THE VETERINARY PROFESSION’S MOST PRESSING ISSUES, BUT WHO SHOULD LEAD THIS?

The recent editorial and articles in this journal seeking to establish a role for the Fellowship of the RCVS are both timely and unanswered (VR, 6/13 February 2021, vol 188, pp 147, 148, 156-157). They reflect a much larger question: ‘What, in modern society, is the veterinary profession for?’ It is a question that would have had a self-evident answer at anytime from the 1760s to the 1960s. But, it is less obvious now.

In the 1760s, the savage global outbreak of rinderpest (cattle plague) caused widespread death in national cattle herds and wildlife, in some places up to 90 per cent mortality. This pandemic led to the creation of the first veterinary schools (Lyon, France in 1761 and the Royal Veterinary College [RVC], London in 1779). Rinderpest struck the UK again during a second pandemic 100 years later, in the 1860s. This stimulated demand for a national capability for diagnosis, control and prevention of animal disease. This responsibility was first shouldered by James Beart Simonds from the RVC who, in 1865, was made the national inspector and chief veterinary adviser – the forerunner of the chief veterinary officer that we have today. He needed a national capability to control the ever-widening rinderpest outbreak and, for this purpose, established the state veterinary service, thereby giving him influence, authority and capability.

During that time, livestock owners would use the services of their local veterinarian to cure their horses or cattle, but the largest single national focus of veterinary manpower was within the veterinary laboratory and field services. With clear management and leadership, these services successfully controlled, if not eradicated, a number of infectious livestock diseases – brucella, bovine tuberculosis (nearly eradicated in the 1980s), classical swine fever and others.

By the time of the foot-and-mouth (FMD) epidemic in 2001, this focus and leadership was lost, and the commanding heights of disease control strategy passed to administrators and epidemiologists outside of the veterinary profession.

In the subsequent 20 years, there has been both a diminution and separation of veterinary field services and veterinary investigation laboratories from a direct central veterinary leadership. There are now fewer vets employed in governmental departments than in most good private veterinary practices.

If the predominant societal purpose of the veterinary profession is still to safeguard the national livestock, are we best organised to do so?

The two FMD outbreaks in the UK, in 1967 and 2001, taught us that we need to invest wisely in research, surveillance and a professional workforce that is capable of responding both early and clearly in any outbreak. Few had predicted either of the FMD outbreaks; the lag in an early reaction was costly. The same could be said of the present Covid-19 pandemic. Do we seriously think that if we were to have another outbreak of FMD, West Nile fever, African horse sickness, or even a novel coronavirus, that we are in a stronger position as a profession to react rapidly and nationally than we were in 2001?

Is it possible that the profession is sleepwalking backwards into the shadows of invited influence?

It is difficult for those working in government service to argue for their own advancement. It must be for the profession itself to prepare the case for them, and to urge the government to sufficiently resource and recruit a dedicated workforce that could deal with future outbreaks quickly and effectively. Perhaps there are lessons to learn from national veterinary services in other countries?

In the recent policy statements from the RCVS, neither the governance1 nor the legislative2 reform consultations address this issue. The BVA has policy statements on a number of topics, the most relevant in this context being ‘veterinary scanning surveillance’3, but even though this has recommendations for establishing independent bodies to oversee surveillance, these have not yet been undertaken. However, what is undoubtedly true is that the research at both the Pirbright Institute and the Moredun Research Institute is outstanding and provides confidence that rapid diagnostic capabilities are available to the veterinary field services.

So, should the role of the RCVS Fellowship be to provide an independent forum of wisdom and expertise from which to address this challenge? Possibly, but I doubt it. Even if it organised enlightened debate and sensible proposals, my experience of working on the Foresight programme in 2006,4 which looked at preparing for future infectious diseases, showed there is little value debating questions for which there is no ownership and no subsequent commitment for action.

Defining our national public service role and getting our voice heard must be one of the most pressing issues for our profession today, but who is going to do it?

Is it possible that the profession is sleep-walking backwards into the shadows of invited influence?

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MILK PREBIOTICS ARE THE CAT'S MEOW

If you haven't been the parent or caregiver of an infant in recent years, you'd be forgiven for missing the human milk oligosaccharide trend in infant formulas. These complex carbohydrate supplements mimic human breast milk and act like prebiotics, boosting beneficial microbes in babies' guts.

Milk oligosaccharides aren't just for humans, though; all mammals make them. And new University of Illinois research suggests milk oligosaccharides may be beneficial for cats and dogs when added to pet diets.

But before testing the compounds, scientists had to find them.

"When we first looked into this, there had only been one study on milk oligosaccharides in dogs, and none in domestic cats. The closest were really small studies on a single lion and a single clouded leopard," says Kelly Swanson, the Kraft Heinz Company Endowed Professor in Human Nutrition in the Department of Animal Sciences and the Division of Nutritional Sciences at Illinois.

"Our study was the first robust characterisation of dog and cat milk oligosaccharides," he adds. "Our data not only provide a better understanding of how milk meets the nutritional needs of newborn kittens and puppies, but also how it helps promote gut immunity and establish a healthy gut microbial community early in life." That research appears in the journal PLoS ONE.

The foundational study identified three predominant oligosaccharide structures in canine milk: 3'sialyllactose, 6'-sialyllactose, and 2'fucosyllactose, the same compound showing up in many infant formulas today. Together, these three structures made up more than 90% of the total oligosaccharides in canine milk.

Feline milk was much more complex and balanced, with approximately 15 structures making up 90% of total oligosaccharides. Of these, difucosyllactose-N-hexaose b, 3'-sialyllactose, and lacto-N-neohexaose represented more than 10% each.

"Even though domestic dogs and cats both evolved as carnivores, they are metabolically distinct in many ways. Although pet cats still exist as true carnivores, pet dogs are omnivorous in nature," Swanson says. "These new milk oligosaccharide data highlight another interesting difference between the species, justifying further research to reveal their role in the nutritional and health status of newborn puppies and kittens."

Even before Swanson and his colleagues identified the oligosaccharides in cat and dog milk, the pet food industry was beginning to recognise the potential benefits of these compounds as supplements in pet foods. In 2019, Swiss biotech company Gnubiotics Sciences announced an animal milk oligosaccharide-like product known as GNU100, but it hadn't been tested in animals. Swanson's team took that on.

In two separate studies, both published in the Journal of Animal Science, Swanson and his colleagues determined the safety, palatability, and digestibility of GNU100 in dogs and cats.

First, in vitro laboratory tests with cellular colonies showed no toxic effects or tendencies to cause cell mutation. There was no reason to expect toxicity, but the result satisfies one of the basic FDA requirements for inclusion of any new ingredient in pet foods.

Next, the researchers mixed GNU100 at 1% with a fat source and coated commercial dry diets for cats or dogs. As a control, fat-coated diets without GNU100 were also offered. When animals got to choose between the control and 1% bowls, they went crazy for the GNU100.

"In the cats, it was a huge preference. They ate nearly 18 times more food with GNU100 than the control food. We had just been hoping they wouldn't reject it. You know, cats can be pretty finicky," Swanson says. "When we got the data back it was like, wow, they really love that stuff! And the dogs did, too."

Swanson explains GNU100 is composed of a complex mixture of oligosaccharides and peptides, small protein-containing compounds that may make the food more appetising to cats and dogs.

Finally, the researchers included GNU100 in experimental diets at 0%, 0.5%, 1%, and 1.5% and fed them to healthy adult dogs and cats for six months. During that time, they measured stool quality, blood metabolites, and nutrient digestibility, and evaluated changes in gut metabolites and the gut microbial community.

Overall, cats and dogs did well with GNU100, with no adverse health effects. And the researchers saw shifts in the gut microbiome toward more beneficial species and their metabolite profiles.

Aside from the palatability test, changes associated with GNU100 were as expected, showing intriguing trends in gut microbiota and gut metabolites that Gnubiotics plans to explore in future studies. Swanson thinks they would have seen bigger benefits in a more targeted study focusing on newborn cats and dogs, geriatrics, or pets with compromised immune systems.

"Theoretically, these products should stabilise and feed good bacteria in the gut as well as limit the growth of potentially undesirable bacteria. So if an animal is undergoing treatment for something with antibiotics or is in a high stress situation, having that product in the diet might keep the gut from destabilising," Swanson says. "Another target group for these products might be young animals as a way to maintain beneficial bacteria in the gut as they wean off their mothers. We'd need to do more testing to see if the product holds up in those target groups, but at least we know now that it is safe and well tolerated."

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PURINA® PRO PLAN® LIVECLEAR™ IS SHOWN TO REDUCE ALLERGENS IN CAT HAIR AND DANDER

A revolutionary approach to managing cat allergens at their source is now available to Aussies for the first time ever: Purina® Pro Plan® LiveClear™ is the first and only cat food to reduce the allergens in cat hair and dander. Pro Plan LiveClear comes in five different variants, and is available now in Petbarn stores across Australia, and from other pet retailers from 1st August 2021.

This new breakthrough in managing feline allergens is the culmination of more than a decade of Purina Institute research, dedicated to finding a safe and effective way to address a problem that impacts up to one in five adults.1,2

Today's announcement is expected to be a welcome relief for some cat allergy sufferers who rate their symptoms as quite severe or very severe. The impact of allergy symptoms have been cited as the reason why allergy sufferers in Australia have either considered relinquishing, or had to relinquish a cat.3

With the capability to reduce the allergens in cat hair and dander with daily feeding in as little as three weeks, Pro Plan LiveClear is outstanding nutrition with the power to change the lives of Australians by potentially helping cat owners with sensitivities become closer to the cats they love.

Pro Plan LiveClear may help keep more cats in their forever homes

Pro Plan LiveClear has the potential to help keep more cats in their 'forever homes,' according to Dr. Zara Boland – Purina Veterinary External Affairs Manager in Australia. In a study of cat relinquishments in Australia, allergies were cited as the reason for the decision in 18% of cases.3

"I am one of many people who experiences sensitivity to cat allergens, which is of course ironic given my line of work! Sadly, sensitivity to allergens is often cited as the reason for relinquishment of pets to animal shelters, or a barrier to cat ownership or adoption, so I'm really optimistic about the meaningful difference Pro Plan LiveClear may make to breaking that pattern," she said.

Managing allergies can be a substantial and ongoing struggle for many. Particularly when it begins to limit the interactions between owners and their cats who would otherwise typically spend 3.4 hours per day together.4 Australian research figures reveal 60% of cat owners consider their cat as a member of the family and 27% describe their cat as a companion, affirming the strong bond between owners and their pets.5

Despite that, many allergy sufferers still choose to have a cat, and current methods for managing cat allergens often include limiting time or activities with the cat; isolating the cat in the home; or even removing the cat from the home altogether.

How Pro Plan® LiveClear™ works

Many people believe that cat hair or dander is the cause of cat allergies, but it's actually what's on the hair that causes the problem.

- Fel d 1 is a protein that cats produce naturally in their saliva.5,6
- All cats produce Fel d 1, regardless of breed, age, hair length, sex or body weight.6,7
- When cats groom, Fel d 1 gets on the hair and skin through the saliva, and eventually into the environment.8
- The key ingredient in Pro Plan LiveClear is a specific protein sourced from eggs.
- When cats eat Pro Plan LiveClear, the protein binds to the Fel d 1 and safely neutralises it in the cat's mouth.
- By reducing active Fel d 1 in the cat's saliva, it reduces the allergen that is transferred to the cat's hair and dander when they groom, ultimately reducing allergens in the environment. 9,10
- In a published study, feeding Pro Plan LiveClear was shown to reduce the allergens in cat hair and dander by an average of 47%, starting in the third week of daily feeding.9

Cat safety was critically important to Purina Institute scientists when developing the product.

"As a cat lover and veterinarian, my focus is on the health and safety of the cats under my care. The beauty of Pro Plan LiveClear is that it reduces cat allergens in cat hair and dander without impacting the physiology of the cat," explains Kurt Venator, Chief Veterinary Officer at Purina. "Because scientists don't know exactly why cats produce Fel d 1, our goal was to neutralise it rather than inhibit its production."

A six-month safety study also showed that the egg product ingredient coating the Pro Plan LiveClear kibble is completely safe for cats to eat.11 The action happens in the cat's mouth, but once swallowed, the ingredient is digested like any other protein.

Pro Plan LiveClear is not intended to replace other allergen-reduction strategies but, rather, to add another measure that can help reduce the allergen burden in cat households. It is a groundbreaking approach to cat allergen management that has the potential to improve the lives of cats and the families who love them.

Pro Plan LiveClear is a 100% complete and balanced dry cat food with outstanding taste and nutrition designed for daily feeding.

Availability and Pricing

Pro Plan LiveClear is available now in Petbarn stores across Australia. It comes in five different formulas to suit different feline dietary needs – Kitten, Adult, Senior, Urinary Care and Indoor/ Hairball Control. RRP from A$49.99.

For more information on the scientific discovery, visit https://www.purina.com.au/brands/purina-pro-plan/live-clear

TRACING AND CONTROLLING HIGH PATHOGENICITY AVIAN INFLUENZA

Scientists have discovered a route of introduction for High Pathogenicity Avian Influenza Virus (HPAIV) H5N8 into Japan and, in parallel, have investigated the potential of two human anti-influenza drugs for the control of HPAI in birds.

Since October 30, 2020, there have been over 30 recorded outbreaks of High Pathogenicity Avian Influenza (HPAI) in domestic poultry and wild fowl in Japan. This outbreak was caused by the influenza A virus H5N8, a known High Pathogenicity Avian Influenza Virus (HPAIV). In such a scenario, identification of the source of the virus and its transmission route is important to control its spread.

A team of scientists led by Professor Yoshihiro Sakoda of Hokkaido University have recently found the probable route of introduction of the current HPAIV into Japan -- by migratory birds from Europe. Separately, they showed that anti-influenza drugs used for humans can potentially be used to treat HPAI in poultry and wild fowl, providing an alternative to culling infected birds. Their findings were published within a week of each other in the journal Viruses.

HPAI is a devastating disease in poultry, leading to large losses both economically and materially. Once present in domesticated poultry, the primary means of controlling HPAI is by culling all infected populations. There is no approved drug for the treatment of HPAI. In addition, it can infect captive wild birds, such as those in zoos and sanctuaries, which has major implications for the protection and conservation of endangered species.

In addition, HPAI is closely related to influenza in humans; certain strains of HPAIV have jumped to humans in the past, most recently in mid February 2021, in Russia. For prevention and control, it is vital to track the spread of this disease.

The scientists collected migratory duck feces samples from the lakeside of Lake Komuke, eastern Hokkaido in October 2020. After a number of tests, they confirmed the presence of H5N8 virus in one of the samples. Further, their genetic analysis showed that the H5N8 virus was closely related to the variants that caused outbreaks in Europe from late 2019 to early 2020 and the variants found in Korea and southern Japan from October to November 2020, rather than from the H5N8 viruses in East Asia from 2018-2019. This suggested that the H5N8 virus transmitted with migratory birds from Europe to Eastern Asia within 10 months. In addition, the team found that it is a different H5N8 variant that is causing current outbreaks in Europe, raising the alarm that the northern biosphere is becoming a reservoir of HPAIV.

The scientists also investigated two antivirals, baloxavir marboxil (BXM) and peramivir (PR), used for the treatment of influenza in humans for their potential to treat HPAI in poultry. In their experiments, both drugs improved the survival rate of infected chickens and reduced viral amounts in their organs and feces, with BXM showing higher efficacy. Further work on BXM suggested that an early single-administration of BXM at doses of 2.5 mg/kg or higher would be most effective for the treatment of HPAI in real-life settings.

“Based on our findings, the government authorities warned poultries in Japan in November last year, which helped local businesses take measures to prevent potential outbreaks. As in the past years, we will continue to monitor HPAIV in migratory birds visiting Hokkaido as well as researching possible treatments of the disease,” said Sakoda.

The next steps would be to confirm if the strain of H5N8 detected by the scientists is responsible for the ongoing HPAI outbreak in Japan, and to verify if BXM is capable of treating HPAI in rare wild birds and poultry farms.

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DISCOVERING CANDIDATE FOR REFLEX NETWORK OF WALKING CATS: UNDERSTANDING ANIMALS WITH ROBOTS

A group of researchers from Osaka University developed a quadruped robot platform that can reproduce the neuromuscular dynamics of animals, discovering that a steady gait and experimental behaviours of walking cats emerged from the reflex circuit in walking experiments on this robot. Their research results were published in Frontiers in Neurorobotics.

It was thought that a steady gait in animals is generated by complex nerve systems in the brain and spinal marrow; however, recent research shows that a steady gait is produced by the reflex circuit alone. Scientists discovered a candidate of reflex circuit to generate the steady walking motion of cats, investigating locomotion mechanisms of cats by reproducing their motor control using robots and computer simulations.

Since experiments using animals are strictly controlled and restricted in terms of animal protection, it is difficult to study animal locomotion. So, it is still unknown how nerve systems discovered in prior research are integrated (i.e., how reflex circuits responsible for animal locomotion are integrated) in the animal body.

Toyoaki Tanikawa and his supervisors assistant professor Yoichi Masuda and Prof Masato Ishikawa developed a four-legged robot that enables the reproduction of motor control of animals using computers. This quadruped robot, which comprises highly back-drivable legs to reproduce the flexibility of animals and torque-controllable motors, can reproduce muscle characteristics of animals. Thus, it is possible to conduct various experiments using this robot instead of the animals themselves.

By searching for the reflex circuit that contributes to the generation of a steady walking in cats through robotic experiments, the researchers found a simple reflex circuit that could produce leg trajectories and a steady gait pattern, which they named "reciprocal excitatory reflex between hip and knee extensors."

In this study, the researchers found that:

- The robot generated steady walking motions by simply reproducing the reciprocal circuit in each leg of the robot.- The robot's gait became unstable when the reciprocal circuit was cut off.
- When the mutual excitatory circuit was stimulated, the circuit produced a phenomenon called 'prolongation of the stance phase.' This result suggests that this circuit is an important component responsible for walking in cats.

This group's research results will benefit both the biology and robotics fields. In addition to bringing new knowledge to biology, if robotic animals could serve as a replacement for real animals in the future, it will give more scientists the chance to study the mechanisms of animal locomotion under various experimental conditions. Approximating a robot's structure to that of an animal will lead to the development of fundamental technologies for making robots that move and manoeuvre as effectively as animals.

Co-author Yoichi Masuda says, "Gaining knowledge about animals without using experimental animals is also significant for the humans that live with them. Further combination of robotics and biology through the creation of robots that mimic the structures of animals and their locomotion could become the first step towards understanding the principles underlying the behaviours of animals and humans."

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NEGATIVE PRESSURE WOUND THERAPY – A FUTURE GAME CHANGER IN THE COMPANION ANIMAL SPACE?

Negative Pressure Wound Therapy (NPWT) is an important clinical tool in the human healthcare population and in many ways has revolutionised the treatment of acute and chronic complex wounds. It is widely used to assist with rapid formation of granulation tissue and to decrease time for wound healing.

The documented success in the human population is well established with many published papers including animal studies confirming the benefits. It provides a promising opportunity for the companion animal and equine populations. Whilst lagging someway behind in the veterinary space it is becoming more popular especially to help manage problematic wounds.

NPWT promotes a favourable wound healing environment. Once applied the closed system protects the tissues against trauma and contamination, leaving the tissues moist whilst removing exudates and infectious materials. At a visible level, subatmospheric pressure helps reduce oedema, dead space and promotes contraction, and at a cellular level, benefits include improved tissue perfusion, fibroblast migration and cellular proliferation.

While there are some contraindications, for example with malignancy or unexplored fisutulas, many wounds from simple lacerations through to severe abscesses, deglovings, skin flaps and grafts can be helped to heal with NPWT.

Results from the case study outlined below provide one such example of the potential to positively impact wound healing outcomes. To quote the doctor who cared for this patient “I would have really struggled with the case without it.”

Izzy is an 11 year old FS Bull Arab Cross who underwent wide surgical excision of a cutaneous haemangiosarcoma, located along the medial aspect of her left stifle. She was treated by the team at Queensland Veterinary Specialists led by Dr Guy Bird.

A flank fold rotation flap was utilised to close the resulting skin defect. Unfortunately, approximately 10 days postop the distal aspect of the wound, that was located over the stifle, began to dehisce.

A tie-over bandage was placed, with a hypertonic saline primary dressing. Unfortunately, at home Izzy was able to pull off the tie-over dressing, even whilst wearing a suitably large E-collar. She was then subsequently hospitalised for continued wound management, as the wound was not making any progress and her owners were not able to keep her appropriately confined.

Whilst in hospital a tie-over bandage dressing was continued with unsatisfactory wound progress. The wound became extremely exudative and her limb became very edematous, inflamed and painful to touch.

There was concern that the wound was becoming infected. A lack of progress was evident in the challenging open wound environment, in a very mobile area, with approx 5-8 cm of dead space, peripheral to the wound edge.

As a result, the decision was made to trial NPWT.

The Dressing remained in place and Izzy did not appear to be bothered by the dressings or NPWT unit.

The dressings were changed every 3-5 days, which enabled closer monitoring of the wound bed. At no point was there a need to change the bandage due to slippage or loss of vacuum. The unit never lost negative pressure. Immediate advantages of the NPWT device meant there was no need to obtain a wound culture nor was Izzy placed on antibiotics.

4 DAYS POST NPWT APPLICATION

7 DAYS NPWT POST APPLICATION

12 DAYS NPWT POST APPLICATION

- Sufficiently long large lumen tubing and connectors allow rapid connection and reduces the likelihood for kinking or obstruction.
- Black foam dressing that can be trimmed to size without fraying and leaving fibres in the wound.
- The device itself is small, light and can run on battery for hours to allow the animal to be moved and exercised without disconnection.
- It is simple to use and includes the ability to adjust the pressure setting or use variable therapy mode.
- Simultaneous irrigation can be used to decrease bioburden in infected wounds.

As demonstrated by the image series, the wound became less exudative, the limb oedema resolved and the skin edges adhered down to the granulation tissue (peripheral dead space was been obliterated).

At this point the wound was starting to contract and epithelialise - NPWT was ceased.

In this instance, the Cardinal Health NPWT system, supplied by Dr Sebastian Menzies at Fourlimb Surgical Solutions, did what would have been very difficult for any other treatment option to achieve. It closed dead space, reduced limb oedema and prevented infection which saved on antibiotics and culture.

The Cardinal Health NPWT system is ideally suited for veterinary use.

- Heat activated adhesive drapes form a strong long lasting seal.

The ultimate aim when dealing with any wound is to return the animal to pain free full function as soon as possible. NPWT helps create an optimal environment to promote wound healing. Fourlimb Surgical Solutions can assist with simple, reliable and flexible options to meet a variety of veterinary clinical needs/ scenarios. With the support of Fourlimb the use NPWT is now a viable and valuable tool to better manage wounds in veterinary clinical practice.

Morykwas MJ et al Vacuum-assisted closure: a new method for wound control and treatment: animal studies and basic foundation - 1997
Borgquist O et al Wound edge microvascular blood flow during negative-pressure wound therapy - 2010. McNulty AK et al Effects of negative pressure wound therapy on fibroblast viability, chemotactic signaling, and proliferation in a provisional wound (fibrin) matrix – 2007
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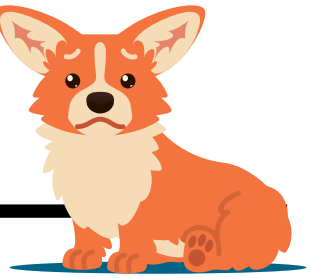
DOGS ACT JEALOUSLY EVEN WHEN THEY DON'T SEE THEIR RIVAL



Past surveys have shown that more than 80% of dog owners report observing jealous behaviours from their dogs -- vocalisations, agitated behaviour, pulling on a leash -- when they give attention to other dogs. New research published in the journal Psychological Science supports these observations and finds that dogs also exhibit jealous behaviours when they merely imagine that their owner is interacting with a potential rival, in this case, a highly realistic artificial dog.

"Research has supported what many dog owners firmly believe -- dogs exhibit jealous behaviour when their human companion interacts with a potential rival," said Amalia Bastos with the University of Auckland and lead author on the paper. "We wanted to study this behaviour more fully to determine if dogs could, like humans, mentally represent a situation that evoked jealousy."

Dogs appear to be one of the few species that might display jealous behaviours in ways similar to a human child showing jealousy when their mother gives affection to another child. In humans, jealousy is closely linked with self-awareness, which is one reason animal-cognition researchers are so interested in studying jealousy and other secondary emotions in animals.

To test how and when dogs display jealous behaviour, the researchers presented 18 dogs with situations where they could imagine a social interaction between their human companion and either a realistic fake dog or a fleece cylinder. The fake dog served as a potential rival for attention while the cylinder served as a control.

In the experiment, the dogs observed the fake-dog rival positioned next to their owner. A barrier was then placed between the dog and the potential rival obscuring them from view. Despite blocking the line of sight, the dogs forcefully attempted to reach their owners when they appeared to stroke the rival fake dog behind the barrier. In a repeat experiment using a fleece cylinder rather than a fake dog, the dogs pulled on the lead with far less force.

Through their study, Bastos and her colleagues found that dogs showed three human-like signatures of jealous behaviour. Jealous behaviour emerged only when their owner interacted with a perceived social rival and not an inanimate object; occurred as a consequence of that interaction and not due to a potential rival's mere presence; and emerged even for an out-of-sight interaction between their owner and a social rival.

"These results support claims that dogs display jealous behaviour. They also provide the first evidence that dogs can mentally represent jealousy-inducing social interactions," said Bastos.

"Previous studies confounded jealous behaviour with play, interest, or aggression, because they never tested the dogs' reactions to the owner and the social rival being present in the same room but not interacting."

"There is still plenty of work to do to establish the extent of the similarities between the minds of humans and other animals, especially in terms of understanding the nature of nonhuman animals' emotional experiences," said Bastos. "It is too early to say whether dogs experience jealousy as we do, but it is now clear that they react to jealousy-inducing situations, even if these occur out-of-sight."

Journal Reference:

Amalia P. M. Bastos, Patrick D. Neilands, Rebecca S. Hassall, Byung C. Lim, Alex H. Taylor. Dogs Mentally Represent Jealousy-Inducing Social Interactions. Psychological Science, 2021; 095679762097914
DOI: 10.1177/0956797620979149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CANINE MONOCYTIC EHRLICHIOSIS – AUSTRALIA'S 'OTHER' EPIDEMIC

BY DR LIISA AHLSTROM (ELANCO ANIMAL HEALTH) AND PROFESSOR PETER IRWIN (MURDOCH UNIVERSITY)

While Australians' minds are occupied with the ongoing coronavirus pandemic, another disease is sweeping across northern Australia that is causing significant illness and losses of dogs in remote regions and indigenous communities.

This disease, canine monocytic ehrlichiosis (CME), caused by the rickettsia-like member of the Anaplasmataceae, Ehrlichia canis (E. canis), is transmitted by Rhipicephalus sanguineus (the brown dog tick). CME is a notifiable disease in Australia so suspected cases must be reported to state veterinary authorities immediately.

Repelling ticks before they bite is essential in being able to prevent transmission of ehrlichiosis, because it can be transmitted within just 3 hours of a tick bite. That's why the APVMA last month granted a permit (APVMA; PER90869) allowing the Seresto Collar for Dogs to be used Australia wide by dog owners to "reduce the transmission of the tick-borne disease caused by the pathogen Ehrlichia canis, thereby reducing the risk of transmission of canine ehrlichiosis between dogs by brown dog ticks".

Prior to the first cases being discovered in Kununurra, in the Kimberley region of WA, in May 2020, the Australian continent was considered free of the disease. Strict pre-import testing of dogs coming to Australia for CME has served the country well until this incursion. Since May last year hundreds of dogs in remote communities of Western Australian and the Northern Territory have tested positive, and a small number of dogs together with infected ticks that carry E. canis bacteria have been detected in South Australia. Ehrlichiosis has now also been diagnosed in other states in dogs that have travelled from northern Australia.

The disease is most prevalent in regional areas and remote communities, where the ability to test dogs is markedly restricted for logistical reasons. Despite being a notifiable disease, the true case numbers are likely to be much higher than reported, as many dogs have been found dead without testing or treatment. Veterinary workers report that dog populations in some communities have been decimated.

Canine ehrlichiosis is a life-threatening disease for dogs and the epidemic now sweeping across the Top End represents the most serious threat to canine health in Australia since the parvovirus outbreaks in the late 1970s and 1980s. Veterinarians throughout Australia should be very concerned about this disease, not only because of its welfare implications, but because CME will now have to be included on the differential diagnosis list for many medical problems in dogs, ranging from unexplained fever, bleeding diatheses and bone marrow disease.

Worrying still is recent research that confirms not only that there has been a southwards expansion of the brown dog tick's geographical range – which is confirmed by the detection of the infected ticks in South Australia, but also that the brown dog tick strain here in Australia is of the 'tropical lineage', which has been proven to be the most effective and capable strain for maintaining the life cycle of E. canis. Worse, the tick is also well adapted to indoor living and readily establishes within kennels or homes, and even in cooler climates.

Historically, E. canis was first discovered in the 1930s, named then as Rickettsia canis due to its close relationship with the rickettsia group of bacteria. However, the disease it causes first came to the attention of veterinary scientists worldwide as 'canine tropical pancytopenia' during the Vietnam War, when scores of United States (and other nationalities') military working dogs, often German Shepherd dogs, were infected and died in southeast Asia.

The life cycle of this vector-borne disease commences after E. canis bacteria are released from the tick's salivary glands and injected into dogs during the very early stages of tick attachment. Indeed, this is a critical fact with respect to preventing dogs from becoming infected as we discuss later in this article. Ehrlichia canis enters the bloodstream and is taken up by monocytes where it multiplies rapidly, spreading throughout the body, and causing clinical signs that are first observed about two weeks after transmission.

Early stages of the disease are characterised by fever, anorexia, lethargy, oedema, ocular signs (conjunctivitis, corneal oedema, uveitis), and bleeding tendencies, such as nose bleeds and widespread petechiae. Some dogs develop severe and rapid weight loss, swollen limbs, difficulty in breathing, blindness and neurological signs.

One of the most serious effects of this disease in the canine patient is on the bone marrow with a frequently fatal outcome. Some dogs die of septicaemia as they can no longer fight off even the most innocuous of infections, or they bleed uncontrollably.

The current outbreak has unique epidemiological features that likely combine to explain why the disease appears to be so devastating as it rolls out across the north. First, there is a well-established population and limitless reservoir of brown dog ticks across all of the Top End. Ideal climatic conditions combined with patchy ectoparasite control in indigenous communities result in very high tick densities. And lastly, and perhaps most critical of all, is the immunologically naïve dog population with respect to E. canis.

Vets in northern Australia are well used to diagnosing tick-borne diseases, notably anaplasmosis (Anaplasma platys infection) and babesiosis (Babesia vogeli), together with other tropical diseases such as hookworm infections that present them with challenging cases to treat. The arrival of ehrlichiosis however is seen as a tipping point, not only medically for the dogs, but also for the mental wellbeing of the vets and vet nurses.

“The situation in some communities has been really devastating” says Dr Sam Phelan, veterinarian for the Roper Gulf Council. “I’d go back to visit families that I’ve known for many years and watched their dogs grow, but now many of those dogs are dead, taken by ehrlichiosis”.

The disease, which is diagnosed using blood tests conducted by state and federal veterinary laboratories, can be treated with antibiotics and other supportive measures, and most dogs will improve, however some may develop a chronic infection that usually has a terminal outcome. Although doxycycline is the drug of choice, it is recommended to be given continuously for 28 days, and this poses significant problems for dog owners in indigenous communities. The literature also reports variable efficacy of doxycycline, especially in more chronic cases, and confirming ‘cure’ has proven difficult in overseas studies. Whilst most dogs will quickly become PCR negative in blood samples, the bacterium may be sequestered in spleen or bone marrow.

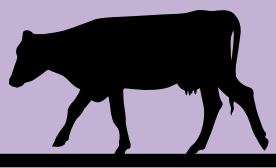
In terms of safeguarding pets, studies have shown that E. canis can be transmitted within 3 hours of tick attachment, which is faster than most tick products can kill ticks. The implication for protecting individual dogs is that a tick product that repels ticks, to prevent ticks biting, is critical. Seresto for Dogs is a long-lasting, water-resistant collar containing imidacloprid and flumethrin that repels and kills ticks on contact for 4 months, and reduces the transmission of tick-borne diseases in dogs, including anaplasmosis, babesiosis and ehrlichiosis. Ticks that come into contact with the hair of a Seresto-treated dog and are repelled will fall off and die, since flumethrin is highly acaricidal on contact with ticks.

However, isoxazolines (afoxolaner, fluralaner, lotilaner, sarolaner) undoubtably have an important role to play in reducing the spread of ehrlichiosis through communities, by contributing to the control of brown dog tick populations. Although isoxazolines kill ticks too slowly to prevent transmission of E. canis from the tick, they are highly effective acaricides that will help break the cycle of disease by stopping an infected dog from being a source of infection for other ticks and dogs in the population.

Finally, are there any implications of this disease for other animals – and humans – in Australia? It would seem that our native marsupials are in no danger from this disease, however the potential impact on dingoes is unknown, and is of great concern. And given the interest in tick-associated illness in humans in Australia, it is worth noting that there have been a small number of reports of E. canis in people in South America.

Pictured: Dr Liisa Ahlstrom (Elanco Animal Health)

VACCINE TARGET FOR DEVASTATING LIVESTOCK DISEASE COULD CHANGE LIVES OF MILLIONS



The first ever vaccine target for trypanosomes, a family of parasites that cause devastating disease in animals and humans, has been discovered by scientists at the Wellcome Sanger Institute. By targeting a protein on the cell surface of the parasite Trypanosoma vivax, researchers were able to confer long-lasting protection against animal African trypanosomiasis (AAT) infection in mice.

The study, published today (26 May 2021) in Nature, is the first successful attempt to induce apparently sterile immunity against a trypanosome parasite. A vaccine was long thought impossible due to the sophisticated ability of the parasites to evade the host immune system. As well as a strong vaccine target for AAT, the findings raise the possibility of identifying vaccine targets for trypanosome species that cause the deadly human infections sleeping sickness and Chagas' disease.

Animal African trypanosomiasis (AAT) is a disease affecting livestock in Africa and, more recently, South America. It is caused by several species of Trypanosoma parasite, which are transmitted by tsetse flies, causing animals to suffer from fever, weakness, lethargy and anaemia. The resulting weight loss, low fertility and reduced milk yields have a huge economic impact on the people who depend on these animals. The disease has been said to lie at the heart of poverty in Africa1.

In humans, a disease called sleeping sickness is caused by infection with another trypanosome species, Trypanosoma brucei. Although control efforts have reduced the number of infections each year considerably, 65 million people remain at risk. In South America, the potentially life-threatening infection Chagas' disease is caused by Trypanosoma cruzi and affects at least 6 million people living in endemic areas2.

All trypanosome species have developed sophisticated anti-immune mechanisms that allow the parasites to thrive in their host. For example, African trypanosomes display a protein on their surface that constantly changes and prevents host antibodies from recognising the pathogen. Until now, it was thought impossible to vaccinate against trypanosome infection for this reason.

In this study, scientists at the Wellcome Sanger Institute analysed the genome of T. vivax to identify 60 cell surface proteins that could be viable vaccine targets. Each protein was produced using mammalian cell lines and then used to vaccinate mice to determine if the host immune system had been instructed to identify and destroy the T. vivax parasite.

One cell surface protein, named 'invariant flagellum antigen from T. vivax' (IFX), was observed to confer immunity against infection in almost all vaccinated mice for at least 170 days after experimental challenge with T. vivax parasites.

Dr Delphine Autheman, first author of the study from the Wellcome Sanger Institute, said: "Scientists have been searching for a way to vaccinate against animal African trypanosomiasis (AAT) since the parasite and vector were first discovered in the early 20th century. We've heard a lot about vaccines recently, but compared to a virus protozoan parasites have a huge number of proteins, making it very difficult to identify the right targets. Several of the 60 targets we tested elicited a partial immune response, but only one conferred the long-lasting protection that makes it a promising vaccine candidate."

Though drugs exist to prevent or treat AAT, many communities that require them live in remote locations that are difficult to access. Reliance on a handful of drugs, and a lack of professional expertise in their administration, are thought to be contributing to increased drug resistance in the parasites3. An effective vaccine would help to overcome some of these practical barriers.

Dr Andrew Jackson, a senior author of the study from the University of Liverpool, said: "It was considered impossible to vaccinate against trypanosome parasites because of the sophisticated immune-protective mechanisms they have evolved, so I'm delighted that we have been able to demonstrate that this can be done. Beyond the obvious benefit of a strong vaccine candidate for animal trypanosomiasis, the genome-led vaccine approach we outline in this study is one that could potentially be applied to other trypanosome species and other parasite families."

The next step will be to validate the results using a cattle model. If successful, work could begin on developing a vaccine for AAT that would be an important tool for tackling poverty in affected regions.

Dr Gavin Wright, a senior author of the study from the Wellcome Sanger Institute and the University of York, said: "This study is an important first step toward relieving the burden of animal African trypanosomiasis (AAT) on both animals and humans in Africa and South America. The protective effect of the vaccine target we identified will first need to be replicated in a cattle model, but I think we can be cautiously optimistic that in a few years' time we will have made substantial progress against this devastating disease."

Michael Pearce, AAT Programme Officer at livestock vaccine organisation GALVmed, said: "Trypanosomiasis remains a major disease challenge for livestock and farmers in Asia, Africa and South America, and is a significant human health problem in Africa and South America. Options for control and treatment of trypanosomiasis are very limited and resistance to currently available medicines is an increasing problem. These novel results from the Sanger Institute are a very important and welcome development, opening up the possibility of successful vaccine development for the prevention and control of trypanosomiasis in both humans and animals."

Journal Reference:

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CORONA WASTE KILLS ANIMALS THROUGHOUT THE ENTIRE WORLD

It all started when litter researchers found a perch in the canals of Leiden that had become caught up in a latex glove. As far as we know, this was the first Dutch victim of corona waste. Since then, they have been trying to obtain an overall picture of the consequences of the corona waste mountain on animals.

Biologists Auke-Florian Hiemstra from Naturalis Biodiversity Centre and Liselotte Rambonnet from Leiden University started a quest to determine how often and where interactions between corona waste and animals occur. They collected observations from Brazil to Malaysia and from social media to local newspapers and international news websites. A fox in the United Kingdom, birds in Canada, hedgehogs, seagulls, crabs, and bats - it transpired that all sorts of animals, everywhere, become entangled in face masks.

They found reports about apes chewing on face masks, and about a penguin with a face mask in its stomach. Pets too, especially dogs, were found to swallow face masks.

“Animals become weakened due to becoming entangled or starve due to the plastic in their stomach,” Rambonnet emphasises.

The diversity of animals influenced by corona waste is considerable. “Vertebrates and invertebrates on land, in freshwater, and in seawater become entangled or trapped in corona waste,” says Hiemstra. In their overview article in the journal Animal Biology, they also write that some animals use the waste as nest material. For example, coots in Dutch canals use face masks and gloves as nest material.

“And the packaging from paper handkerchiefs is found in nests too. As such, we even see the symptoms of COVID-19 in animal structures,” says Hiemstra.

Citizen Science

The scientists from Leiden were able to create their overview thanks to the observations of photographers, litter collectors, birdwatchers, wildlife rescue centres, and veterinarians who shared the observations via social and traditional media. Rambonnet: “As a result of this, we can learn more about the impact of this category of disposable products on wildlife. We therefore ask people to keep sharing their observations so that we can maintain an up-to-date overview.” To facilitate this, the duo has set up the website http://www.covidlitter.com. Rambonnet and Hiemstra hope that this overview will increase people’s awareness of the danger of face masks and gloves for wildlife. Furthermore, they call upon everybody to use reusable face masks.

The scientific publication is the first mention of animals integrating corona litter into their nests; in this case a coot’s nest.
CREDIT: Alexander Schippers

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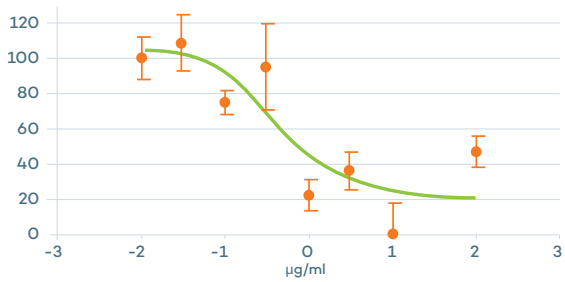

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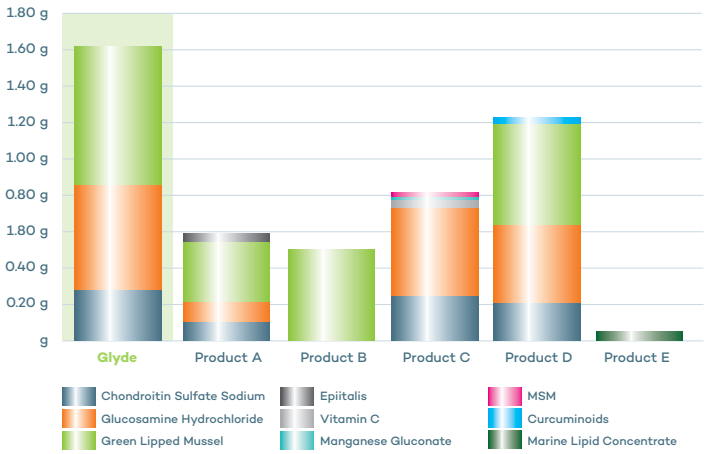

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