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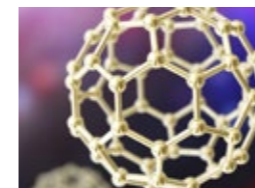
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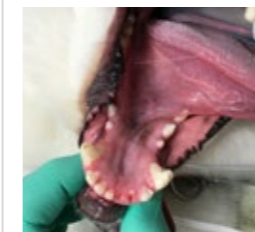
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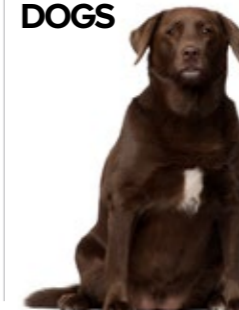
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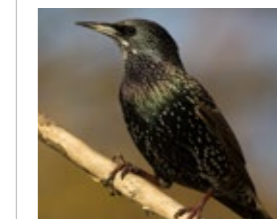


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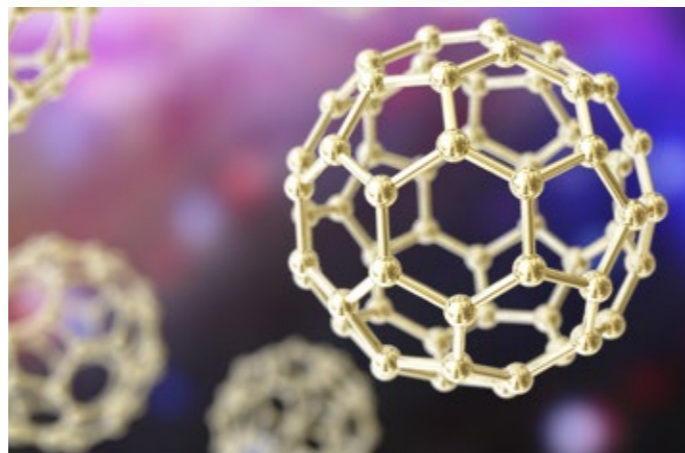
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ENHANCED THERAPEUTIC VACCINE PLATFORM ACHIEVES 2 PROOF- OF-CONCEPTS IN VETERINARY MEDICAL USE

SCIENTISTS FROM THE UNIVERSITIES OF BERN, ZURICH AND OXFORD AS WELL AS THE LATVIAN BIOMEDICAL RESEARCH & STUDY CENTRE LED BY PROF. MARTIN F. BACHMANN (UNIVERSITY CLINIC OF RHEUMATOLOGY, IMMUNOLOGY AND ALLERGOLOGY, UNIVERSITY OF BERN) HAVE DEVELOPED A NEW THERAPEUTIC VACCINE TECHNOLOGY BASED UPON ENHANCED VIRUS LIKE NANOPARTICLE CONJUGATES. THESE VACCINES ARE BEING DEVELOPED BY JOINT EFFORTS OF ACADEMIC LABS, UZH SPIN-OFF COMPANIES (EVAX AG AND HYPOPET AG), A PRIVATELY HELD BIOTECH COMPANY SAIBA GMBH AND INNOVATIVE BRITISH ANIMAL HEALTH COMPANY BENCHMARK HOLDINGS PLC.

Prof. Martin F. Bachmann has been working for many years on the development of therapeutic vaccines with notable successes that include a vaccine against hypertension (Lancet. 2008 Mar 8;371(9615):821-7) and CAD106, a vaccine against Alzheimer's disease that is now in registration studies with Novartis. The new enhanced vaccine platform has been engineered to incorporate a universal T-cell epitope for adaptive immune activation, a stimulator of innate immunity, and repetitive antigen presentation in a nanoparticle. Thus the vaccine platform is optimized for elderly and immuno-compromised individuals leading to induction of strong immunity and a high responder rate. This cutting-edge technology enables the latest advances in biologic medicines to be translated for use in companion animals at affordable prices - an option that will likely change the way we will medically treat our furry partners.



The clinical potential of these vaccine candidates for use in veterinary medicine is now highlighted by two articles published back to back on the 4th of April 2018 in The Journal of Allergy and Clinical Immunology (JACI), the most-cited journal in the field of allergy and clinical immunology. The team of scientists developed breakthrough therapies for insect-bite hypersensitivity in horses and atopic dermatitis in dogs by displaying either equine IL-5 or canine IL-31 on the immunologically optimized virus-like particles (NPJ Vaccines. 2017 Oct 23;2:30.). Thus, the researchers were able to generate vaccines that induced clinically effective levels of neutralising target specific anti-cytokine antibodies, which resulted in dramatically improved disease symptoms in immunised animals. This has previously only been achieved by passive immunisation with high amounts of monoclonal antibodies.

These vaccines are now being developed as first-in-class breakthrough-medicines for treating chronic allergic diseases in the respective target species.

Vaccine against Insect-Bite Hypersensitivity (IBH) in Horses

Allergic skin reactions caused by insect bites are the most common type of allergies in horses. One important form of such a skin allergy is called sweet itch, summer eczema or insect-bite hypersensitivity (IBH), and manifests in weeping and bleeding lesions including crust formation, scales, swelling and lichenification of the skin.

Thirty-four sweet itch affected Icelandic horses participated in a placebo-controlled double blinded clinical study performed by Fettelschoss-Gabriel et al., whereof 19 horses received vaccine and 15 horses received placebo. The vaccine consisted of two components coupled together. The first component is a general immune activation part based on the above mentioned enhanced virus like nanoparticle, the second component is IL-5, a self-molecule. IL-5 is a cytokine and the master-regulator of eosinophil development and activation, a major effector cell type in allergy. Immunization with this conjugate vaccine was well tolerated and resulted in IL-5 specific auto-antibodies which neutralised its target. This limited the number of eosinophils localised to the skin and thereby reducing tissue damage. This resulted in strongly reduced skin lesion scores in vaccinated compared to the previous season as well as placebo.

Unlike done in classical desensitisation, where one tries to make the immune system tolerant to the allergens, Fettelschoss-Gabriel

et al. targeted the key effector cell in insect bite hypersensitivity, the eosinophil. This cell type also plays a key role in allergic human asthma and monoclonal antibodies against IL-5 have recently become an important new weapon for the treatment of the human disease. The new insights gained in horses may help to develop a similar new medicine in humans.



Vaccine against Atopic Dermatitis in Dogs

Atopic dermatitis (AD) is the most common allergic skin disease in dogs. Extensive itching causes scratching which results in loss of fur and secondary infections of the skin, accelerating the symptoms. AD not only affects the well being of dogs but also impacts the quality of life of their owners. IL-31 is a key cytokine driving itching, and a monoclonal antibody against IL-31 has been licensed for use in dogs for the treatment of AD. The teams of Prof. Martin Bachmann and Prof. Claude Favrot describe the development of a virus-like particle based vaccine against canine IL-31, and demonstrate that immunised dogs mount a robust IgG response which essentially abrogates symptoms of itching in house-dust mite sensitised and challenged dogs. Hence, Bachmann et al. present a breakthrough therapy of vaccination against IL-31, which is not only a promising mode to treat AD in dogs but may also facilitate development of a similar vaccine in humans.



EMERGING SIGNIFICANCE OF GAMMAHERPESVIRUS AND MORBILLIVIRUS INFECTIONS IN CATS

Emerging infectious diseases comprise a substantial fraction of important human infections, with potentially devastating global health and economic impacts. A 2008 paper in *Nature* described the emergence of no fewer than 335 infectious diseases in the global human population between 1940 and 2004. In the veterinary field, just as in the medical field, advanced molecular techniques and sophisticated computer-based algorithms for genetic sequence assembly and analysis have revolutionised infectious disease research. They have also raised important questions, as the potential pathogenic role of novel viruses can be difficult to determine.

What is well understood is that novel viruses may contribute to diseases that are major causes of feline morbidity and mortality, including cancer and chronic kidney disease (CKD). A state-of-the-art review article published in the *Journal of Feline Medicine and Surgery* in January focuses on two novel viruses that have the potential to negatively impact feline health and welfare globally - gammaherpesvirus and morbillivirus. Writing for an international audience of veterinary practitioners and feline researchers, an expert group of feline virologists, clinicians and pathologists from Australia, New Zealand and the USA, led by Dr Julia Beatty, of the University of Sydney, discusses aspects related to virus discovery, epidemiology, pathogenesis, diagnosis, prevention and zoonotic potential.*

For many years, domestic cats were identified as the natural host for just a single herpesvirus, feline herpesvirus 1, which is a common cause of ocular and upper respiratory tract disease. In 2014, a targeted virus discovery programme, prompted by the clinical observation that cats develop the types of cancer that, in humans, are caused by gammaherpesviruses, identified *Felis catus* gammaherpesvirus 1 (FcaGHV1). The first gammaherpesvirus known to infect domestic cats, FcaGHV1 is widely endemic; studies suggest that cats can be infected from 2 months of age, and that most adult cats are persistently infected. What is not yet known is whether FcaGHV1 has any pathogenic role in cats. Comparative evidence, however, suggests that while gammaherpesvirus infections typically remain subclinical, in certain circumstances, often after many years of infection, they can cause severe and frequently fatal disease. For example, Epstein-Barr virus, a gammaherpesvirus that infects over 90% of adult humans and is usually innocuous, occasionally causes lymphomas, carcinomas and other cancers. Dr Beatty and her coauthors hypothesise that if FcaGHV1 is pathogenic in cats, it is likely that disease would similarly be only a rare outcome of chronic infection, with most infected animals remaining asymptomatic. Given how widely distributed FcaGHV1 is, the total number of potential disease-affected animals could nevertheless be sizeable.

Feline morbillivirus (FeMV) was first reported in domestic cats in Hong Kong and China in 2012, and has since has been detected in Japan, Europe and the Americas. It was named as the seventh species in the genus *Morbillivirus*, alongside important pathogens of humans and animals such as measles virus and canine distemper virus. Despite a widespread distribution, like FcaGHV1 it is unclear whether FeMV causes disease in cats. Of particular



interest to the veterinary community, however, is a tantalising link that has been suggested in several reports between FeMV and tubulointerstitial nephritis, the pathological manifestation of feline CKD. The authors caution though that pathogenesis studies have yet to be performed to definitively assess causation.

While many emerging diseases in humans originate in animals, there is no known zoonotic risk associated with these two viral infections. Limited transmission between felids is known to be possible, at least for gammaherpesviruses, with infection of critically endangered Tushima leopard cats with FcaGHV1 recently having been identified in Japan.

Technological advances mean that the rate at which novel viruses are being discovered now exceeds our understanding of their clinical relevance. The authors conclude that deciphering the impact of these viruses in cats will require multiple lines of investigation, and the practising veterinarian has an important role to play. Ultimately, the identification of new viral pathogens is not all bad news for cats, as it raises the prospect of improved patient outcomes through specific treatment and, more significantly, disease prevention through viral control measures.



Reference
Jones KE, Patel NG, Levy MA, et al. Global trends in emerging infectious diseases. *Nature* 2008; 451: 990-993.
*Beatty JA, Sharp CR, Duprex WP, et al. Novel feline viruses: emerging significance of gammaherpesvirus and morbillivirus infections *J Feline Med Surg* 2019; 21: 5-11. The article is free to read here.

BARBER'S POLE WORM LOVES WARM WET WEATHER



Sheep losses from Barber's pole worm are being seen in the Wimmera with the warm weather following the rainfall a few weeks ago.

Agriculture Victoria Senior Veterinary Officer Paul Beltz said this blood sucking stomach parasite thrives in warm, moist conditions where it can build up to lethal numbers very quickly.

"Barber's Pole worm (*Haemonchus contortus*) is present on farms across Victoria but rarely causes disease as our climate doesn't normally favour it reproducing," Paul said.

"Female *Haemonchus* worms lay huge numbers of eggs, so a rapid population explosion is likely over weeks when weather conditions favour it, such as what we are experiencing now.

"Sheep producers, already checking their stock for flies, should be on the look-out for a tail of unthrifty sheep suddenly appearing in the mob.

"Affected sheep will be weak, not thriving and have very pale eyelids and gums. This worm does not cause scouring; rather, affected sheep will have firm pellets. In some instances, the first sign may be sheep dying."

Paul said there are a number of test that can easily diagnose Barber's Pole, such as a faecal egg count (FEC) or sheep necropsy.

"Fortunately, in Victoria most drenches should control the disease as drench resistance is not apparent with this worm here," Paul said.



ALGORITHM TO PREDICT PEDV OUTBREAKS



Researchers from North Carolina State University have developed an algorithm that could give pig farms advance notice of porcine epidemic diarrhea virus (PEDV) outbreaks. The proof-of-concept algorithm has potential for use in real-time prediction of other disease outbreaks in food animals.

PEDV is a virus that causes high mortality rates in preweaned piglets. The virus emerged in the U.S. in 2013 and by 2014 had infected approximately 50 percent of breeding herds. PEDV is transmitted by contact with contaminated fecal matter.

Gustavo Machado, assistant professor of population health and pathobiology at NC State and corresponding author of a paper describing the work, developed a pipeline utilizing machine-learning techniques to create an algorithm capable of predicting PEDV outbreaks in space and time.

Gustavo, with colleagues from the University of Minnesota and Brazil's Universidade Federal do Rio Grande do Sul, used weekly farm-level incidence data from sow farms to create the model. The data included all pig movement types, hog density, and environmental and weather factors such as vegetation, wind speed, temperature and precipitation.

The researchers looked at "neighborhoods" that were defined as a 10-kilometer radius around sow farms. They fed the model information about outbreaks, animal movements into each neighborhood and the environmental characteristics inside each

neighborhood. Ultimately, their model was able to predict PEDV outbreaks with approximately 80 percent accuracy.

The most important risk factor for predicting PEDV spread was pig movement into and through the 10 km neighborhood, although neighborhood environment -- including slope and vegetation -- also influenced risk.

"This proof-of-concept model identified the PEDV spread bottleneck in North Carolina and allowed us to rank infection risk factors in order of importance," Gustavo says.

"As we get more data from other farm sites across the USA, we expect the model's accuracy to increase. Our end goal is to have near real-time risk predictions so that farmers and veterinarians can provide preventative care to high-risk areas and make decisions based on data."

Next steps for the researchers include improving the model to predict a wider range of diseases and expanding it to include other industries, such as poultry.

Journal Reference:

Gustavo Machado, Carles Vilalta, Mariana Recamonde-Mendoza, Cesar Corzo, Montserrat Torremorell, Andrez Perez, Kimberly VanderWaal. Identifying outbreaks of Porcine Epidemic Diarrhea virus through animal movements and spatial neighborhoods. *Scientific Reports*, 2019; 9 (1) DOI: 10.1038/s41598-018-36934-8

CONTROLLED DRUGS - BACKGROUND/ OVERVIEW IN VETERINARY INDUSTRY

Whether it be for pain relief, anaesthetic or other reasons, controlled (Schedule 8) drugs such as Morphine, Ketamine and Temgesic are integral to the daily working lives of veterinarians around the country. Due in part to their strength and addictive nature, veterinarians are legally required to store these medications in a locked safe or cabinet, and when they transact upon these controlled drugs they have a legal obligation to record these transactions in a drug register on a daily basis.

The recording of Schedule 8 Medications are heavily regulated by State Government Health Departments and audits are often carried out by health inspectors to ensure veterinary premises are compliant with the regulations.

Vet Staff Welfare

It is a known fact that mental health issues and instances of suicide occur at abnormally higher rates within the veterinary industry than the vast majority of other industries, and this may be in part due to the relative ease of access to these medications within clinics, notwithstanding obligations to legally keep them safe and secure.

Additionally, traditional paper drug registers monitoring the transactions of controlled drugs have the ability to be too easily forged or scribed with illegible handwriting, potentially leading to issues with misappropriation of controlled substances that may not be uncovered for days, weeks or even months or years in some cases.

This is one of the major factors why veterinarians are choosing to migrate from traditional paper controlled drug registers to electronic controlled registers that have significant improvements from a medication governance perspective, including intelligent functionality such as the ability to provide real-time alerting mechanisms (to vet owners or practice managers) when there are discrepancies with stock levels or stock adjustments have been made. Additionally, electronic registers have the ability to filter data for fast investigative purposes if and when investigations into discrepancies are required.

Whilst the benefits of going paperless with regards to controlled drug transactions are compelling from a medication governance and compliance perspective, electronic controlled drug registers also have another huge benefit - time savings.

Through integration with Vet Practice Management software, electronic registers completely eliminate the double entry of data that is required for both their vet practice management software as well as their drug registers.



This is a significant win for veterinarians, especially those who are time poor or are looking to significantly reduce their administrative workloads.

Vet S8 General Info

Vet S8 is an electronic drug register, specifically designed for vets, that replaces manual recording of S8's (controlled drugs). It essentially replaces the paper register book used to manually record all S8 drug transactions (patients, suppliers, stock transfer, etc).

Vet S8 key features and benefits

- Paperless solution - quicker and easier way of recording the information
- Free 30 day trial
- Helps to reduce errors and maintain accurate records
- Don't have to step away from your computer and manually enter data
- Takes the hassle out of stock checks/reconciliations
- Provides customised reporting (patient, drug, period of time, etc) at the press of a button
- Extremely cost effective - \$299+GST annually (up to 100 transactions a month) or \$399+GST annually (unlimited transactions)
- Software, support and updates included in price.

Vet S8 is also a web-based (online) product, meaning that an internet connection is required to use the software. The advantages of having a web-based product are:

- No software to download or install
- No requirements to update the software
- Can be used on multiple workstations at no extra cost

Integration with VPM Software

Vet S8 currently integrates with all popular vet practice management software products.

The advantage of Vet S8 integration with VPM software is that it completely eliminates double entry of manually entering data into their registers. The data would be automatically transferred across to Vet S8 from their VPM software, and all the users would have to do in Vet S8 is enter their unique password to verify the data and the listing electronically.

State Health Department Approval Status

Vet S8 is permitted for use in all Australian States and Territories.

Training/Support

Modeus provides remote training as well as ongoing support to veterinary practices (if required) to ensure they are fully competent to use the software. Vet S8 is designed to be an intuitive and user-friendly product and we anticipate that users will get used to the functionality of the product very quickly and will no doubt get much enjoyment from the benefits of moving from a paper-based to an electronic system.



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DPIRD DIAGNOSTIC EXPERT CERTIFIED AS WORLD-CLASS



Western Australia's animal health status is in the expert hands of veterinary pathologists with the Department of Primary Industries and Regional Development (DPIRD) to diagnose livestock, aquatic or wildlife disease.

Rapid, accurate diagnoses are essential to protect domestic and international markets and public health from diseases of concern.

DPIRD pathologist Megan Curnow recently boosted the international credentials of the department's diagnostic team after receiving a Diplomate of the American College of Veterinary Pathology.

Senior veterinary pathologist Shane Besier said the Diplomate certification by the American Board of Pathology was the highest certification possible in veterinary pathology and was internationally recognised.

“This certification recognises that candidates who successfully sit the exam are the foremost experts in the field of veterinary pathology,” Shane said

“The department supported Megan to undertake the challenging examinations and will benefit from her skills and credentials to diagnose exotic diseases.

“In 2017/18, our laboratories carried out 1,243 animal disease investigations. The test results are used to support Western

Australia's proof of freedom from significant diseases that could affect export markets.

“Megan will support this investigative work and help develop animal health and diagnostics policy, as well as mentor new pathologists and trainee veterinarians across the state to build diagnostic expertise in WA.”

Megan said it had been arduous managing the enormous amount of study required for the pathology exams held in Tampa, Florida last year.

“It would have been impossible to achieve this result without the support of DPIRD, my pathology colleagues and mentors from other pathology groups,” she said.

Megan graduated from veterinary medicine in 2011 and completed her Masters of Veterinary Clinical Studies in Veterinary Pathology at Murdoch University in 2015.

Originally from England, she grew up in Albany on a hobby farm, where her interest in animal disease began.

“I've always been fascinated by pathology. I love solving puzzles and that's often what disease investigations come down to,” Megan said.

“It is extremely satisfying to be able to make a critical diagnosis and help resolve animal health issues knowing that information we provide as pathologists helps individual producers and their herd but also potentially the whole WA livestock industry.”

VETERINARIANS APPOINTED TO ASEL REVIEW COMMITTEE



The Australian Veterinary Association (AVA) has welcomed the announcement of three veterinarians appointed to the Technical Advisory Committee reviewing the Australian Standards for the Export of Livestock (ASEL).

Dr. Chris Back, Dr. Teresa Collins and Dr. Hugh Millar are all highly regarded for their expertise in production animal health and welfare.

AVA President, Dr. Paula Parker, said that the association had been calling for the inclusion of vets on the committee.

“We're really pleased with this decision. Veterinarians have expert knowledge in both animal health and welfare aspects of the live export process. These are essential skills to ensure we maintain the highest standards in Australia's livestock export supply chain.

“As part of the ASEL Reference Group, we look forward to providing further input to ensure the standards governing live export are science-based and represent best practice,” Paula said.

The committee will be supported by the ASEL Reference Group that comprises the AVA, the RSPCA, ALEC, and livestock producer groups.



DO BIGGER BRAINS EQUAL SMARTER DOGS? NEW STUDY OFFERS ANSWERS



Bigger dogs, with larger brains, perform better on certain measures of intelligence than their smaller canine counterparts, according to a new study led by the University of Arizona (UA).

Larger-brained dogs out perform smaller dogs on measures of executive functions – a set of cognitive processes that are necessary for controlling and coordinating other cognitive abilities and behaviors. In particular, bigger dogs have better short-term memory and self-control than more petite pups, according to the study published in the journal *Animal Cognition*.

“The jury is out on why, necessarily, brain size might relate to cognition,” said lead study author Daniel Horschler, a UA anthropology doctoral student and member of the UA's Arizona Canine Cognition Center. “We think of it as probably a proxy for something else going on, whether it's the number of neurons that matters or differences in connectivity between neurons. Nobody's really sure yet, but we're interested in figuring out what those deeper things are.”

Canine brain size does not seem to be associated with all types of intelligence, however. Daniel found that brain size didn't predict a dog's performance on tests of social intelligence, which was measured by testing each dog's ability to follow human pointing gestures. It also wasn't associated with a dog's inferential and physical reasoning ability.

The study's findings mirror what scientists have previously found to be true in primates – that brain size is associated with executive functioning, but not other types of intelligence.

“Previous studies have been composed mostly or entirely of primates, so we weren't sure whether the result was an artifact of unique aspects of primate brain evolution,” Daniel said. “We think dogs are a really great test case for this because there's huge variation in brain size, to a degree you don't see in pretty much any other terrestrial mammals. You have chihuahuas versus Great Danes and everything in between.”

Daniel's study is based on data from more than 7,000 purebred domestic dogs from 74 different breeds. Brain size was estimated based on breed standards.

The data came from the citizen science website *Dognition.com*, which offers instructions for dog owners to test their canines' cognitive abilities through a variety of game-based activities.

The users then submit their data to the site, where it can be accessed by researchers.

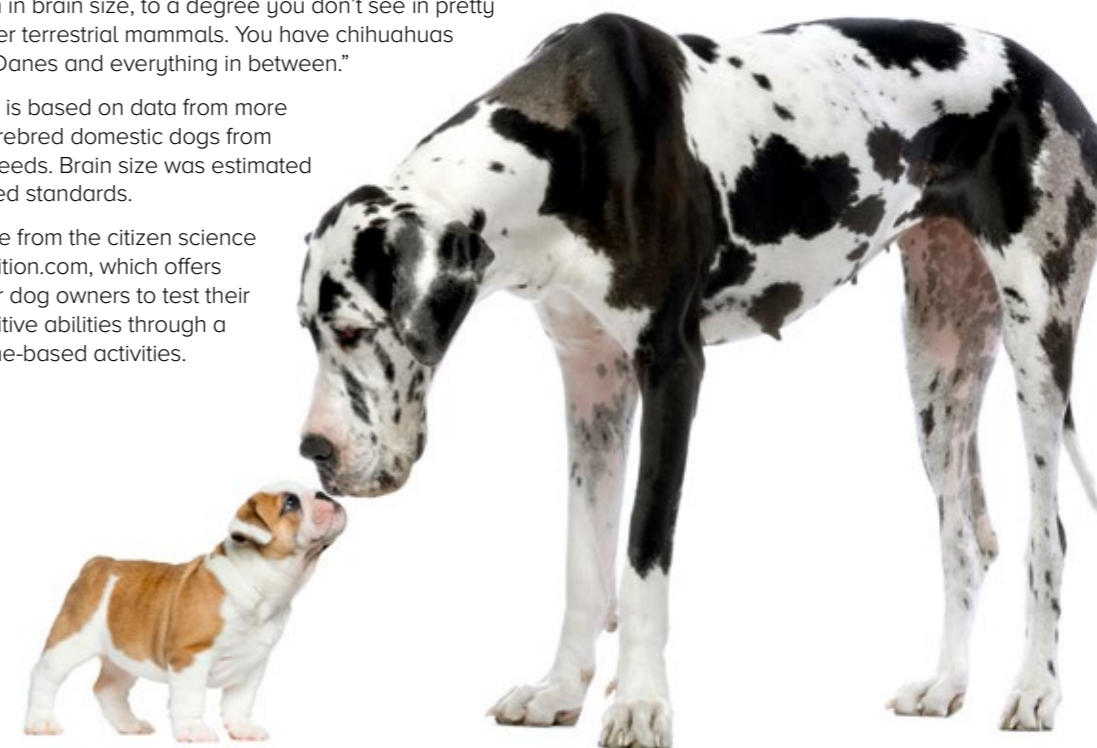
Short-term memory was tested by dog owners hiding a treat, in view of their dog, under one of two overturned plastic cups. Owners then waited 60, 90, 120 or 150 seconds before releasing their dog to get the treat. Smaller dogs had more difficulty remembering where the treat was hidden.

To test self-control, owners placed a treat in front of their seated dog and then forbade the dog from taking it. Owners then either watched the dog, covered their own eyes or turned away from the dog. Larger-breed dogs typically waited longer to snag the forbidden treat.

Daniel and his colleagues controlled for whether or not the dogs had been trained. They found that larger-brained breeds had better short-term memory and self-control than smaller dogs, regardless of the extent of training the dogs had received.

In the future, Daniel said he'd like to do comparative studies of cognitive abilities in different breed varieties, such as the miniature poodle and much larger standard poodle, which are essentially the same except for their size.

“I'm really interested in how cognition evolves and how that arises biologically,” Daniel said. “We're coming to understand that brain size is in some way related to cognition, whether it's because of brain size specifically or whether it's a proxy for something else.”



Journal Reference:

Daniel J. Horschler, Brian Hare, Josep Call, Juliane Kaminski, Ádám Miklósi, Evan L. MacLean. Absolute brain size predicts dog breed differences in executive function. *Animal Cognition*, 2019; DOI: 10.1007/s10071-018-01234-1

TASSIE DEVIL CANCER UNLIKELY TO CAUSE EXTINCTION



A new study of Tasmanian devils has revealed that a transmissible cancer which has devastated devil populations in recent years is unlikely to cause extinction of the iconic species.

New research led by Dr Konstans Wells from Swansea University has revealed that it is more likely that the disease will fade-out or that the devils will coexist with Tasmanian Devil Facial Tumour Disease (DFTD) in future.

DFTD typically kills the majority of devils it infects and has wiped out around 80% of wild devils with continuous decline of existing populations since the disease was first identified.

An international team of scientists from the UK, Australia and the USA matched field epidemiological evidence from wild populations collected over a 10-year period in north-west Tasmania with simulation studies, which revealed that DFTD is unlikely to continue causing ongoing population declines of Tasmanian devils in future.

They say the findings of their study, published in *Ecology*, offers much-needed hope that the species, which is the world's largest remaining marsupial carnivore, will not necessarily become extinct due to DFTD.

First discovered in north-eastern Tasmania in 1996, DFTD causes tumours to form on the face and neck of the animal. The cancer spreads when the devils bite each other's faces during fighting, thus killing the animals within six to twenty four months.

Dr Wells, lead author of the study, said: "Our findings suggest that immediate management interventions are unlikely to be necessary to ensure the survival of Tasmanian devil populations. This is because strong population declines of devils after disease emergence do not necessarily translate into long-term population declines."

To explore the long-term outcomes of DFTD and devil populations, the researchers conducted a large number of simulations of possible disease spread in devils. Based on evidence such

as current infection rates in the wild, the most likely simulation scenarios were selected to explore how DFTD will affect devil populations over the next 100 years. Among the most likely scenarios were those in which DFTD faded out (57% of likely scenarios) or coexisted with devils (22% of likely scenarios).

Co-author of the study, Dr Rodrigo Hamede from the University of Tasmania, said: "With growing evidence that devils are showing signs of adaptation to DFTD and that so far the disease has not caused local extinctions, management actions targeted at understanding the devil's adaptive strategies to cope with DFTD should be considered.

"Complete eradication of DFTD is not feasible, therefore studying the long-term interactions between devils and tumours will provide a realistic prognosis for the species and at the same time will help us to understand important evolutionary processes. This is particularly relevant given the recent outbreak of a new transmissible cancer -- devil facial tumour 2 -- affecting devil populations in south-eastern Tasmania. Devils seem to be prone to transmissible cancers, so studying epidemic dynamics and evolutionary responses to this type of diseases should be a priority."

The research suggests that management efforts to maintain devil populations should be guided by the changing understanding of the long-term outcome of the disease impact on devils.

Dr Wells explained: "Management efforts in wild populations that solely aim to combat the impact of DFTD can be counterproductive if they disrupt long-term forces at work that may eventually lead to stable devil populations that are well able to persist with the cancer.

"Wildlife diseases such as DFTD should not disguise the fact that sufficiently large and undisturbed natural environments are a vital prerequisite for wildlife to persist and eventually cope with obstructions such as infectious diseases without human intervention."



Journal Reference:
Konstans Wells, Rodrigo K. Hamede, Menna E. Jones, Paul A. Hohenlohe, Andrew Storfer, Hamish I. McCallum. Individual and temporal variation in pathogen load predicts long-term impacts of an emerging infectious disease. *Ecology*, 2019 DOI: 10.1101/392324

ENDANGERED PRZEWALSKI FOAL BORN AT WERRIBEE ZOO



Werribee Open Range Zoo's new male Przewalski foal, Bataar, is already a hero despite only being welcomed into the world and his herd in January.

Bataar – a Mongolian name meaning 'hero or a heroic figure' – has been settling in to life well since he was born in the early hours of January 8th to Mum Mahan.

The rare animal, also known as the Mongolian Wild Horse, is a special addition to the zoo's herd – there are only around 2,000 of them left in the world.

Once ranging across parts of Europe and central Asia, this subspecies of wild horse was listed as extinct in the wild in the 1960s by the International Union for Conservation of Nature and Natural Resources (on the IUCN Red List).

Over the past 50 years, zoos around the world have worked together on an international breeding program to bring the species back from the brink and reintroduce the horses to the wild.

Foals like Bataar are proof of the success of captive breeding programs, including the one at Werribee Open Range Zoo, which is helping with the animal's fighting extinction mission.

Keeper Linda Gardiner emphasises the importance of Bataar's birth.

"There's been so much effort and dedication around the world in increasing numbers of this horse over the years, and it's really

important and wonderful to be able to contribute globally to such a vital endangered species breeding program," she said.

"Bataar's got the whole herd looking out for him so he doesn't have a trouble in the world. He's growing stronger and more confident by the day."

Although numbers are increasing, Bataar is still one of only around 2,000 Przewalski's horses in the world. There are less than 200 mature individuals in the wild. They are now listed as endangered and are the only surviving species of wild horse, having never been domesticated by humans.

A visit to Werribee Open Range Zoo provides a rare opportunity to see this animal on the Zoo's Safari Bus Tours, which are included in general entry.



MELBOURNE ZOO BUILDS WORLD-FIRST WATER GYM FOR REPTILES



Melbourne Zoo has built a revolutionary, world-first hydro gym for its reptiles - designed to keep the animals fit and healthy.

The concept for the custom-designed exercise pool is the result of more than a decade of extensive planning by the zoo's Reptiles, Invertebrates and Education Life Sciences team.

Keeper Alex Mitchell said the new facility was keeping the animals fit and active and, in turn, helping prevent illness and disease.

"The hydro gym is a temperature-controlled, filtered body of water, which allows keepers to manage water flow through the tank," Alex said.

"Swimming against the current in the water enables the animals to build up their level of fitness, increase their muscle tone and be active, much like their wild counterparts would."

Boasting an ultra-violet (UV) sterilising unit, inline heating and hydro pumps, it is believed to be the first of its kind in the world.

Since the completion of the facility, a variety of the zoo's reptiles have been reaping the benefits of their new exercise sessions.

"Eastern Diamond-back Rattlesnakes often swim for a good period of time, whilst small monitor lizards, turtles and a variety of other snake species have also been swimming, which will assist with

maintaining excellent levels of fitness in these species," Alex said.

He said keepers had been passionately working on the hydro gym project for several years.

"The concept has evolved over time, from attempting to encourage snakes to swim and exercise in a bucket of water, into the revolutionary facility we have today. It has allowed us to raise the bar in the welfare management of reptiles."

The hydro gym operates in an off-limits facility within Melbourne Zoo's Reptile House.





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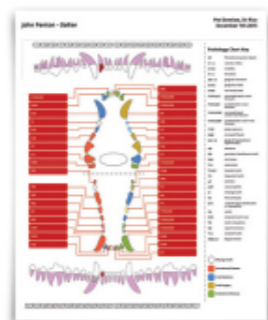
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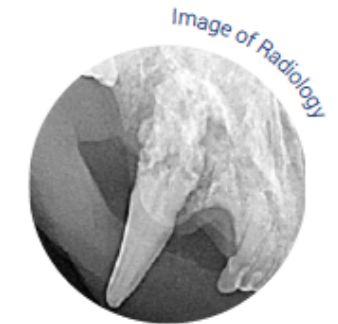
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- Dr Ira Luskin, DAVDC, Specialist Veterinary Dentist
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When did you last review the reminders we trust you're sending? Here's a list of questions to ask yourself and to help you decide if your current system is up to the job:

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- Can you view instantly every message your client has received irrespective of the delivery route?
- Who does them and what happens when they're not there?
- How long does it take, and could they be doing something else even more productive?
- Do you cost the labour/stationery/postage/SMS charges?
- Do they go out daily/weekly/monthly and is it a regular task or a "when we have time task"?
- Is the data live or does it rely on downloading reports and lists?
- Are messages personalised to the owner and do they name the pet/pets?

- Is it clear SMS messages come from your clinic not the competitor e.g. My Vet as opposed to 0407 123 456
- Do your messages look professionally designed and presented i.e. utilising rich text email and digital print with species specific graphics?
- Do multi-pet households receive multiple messages on the same day and unsubscribe as a result?
- Can your system cope with "dirty" data? For example, mobile numbers in the wrong field or with extraneous text in the phone field e.g. Mr/Mrs/Home/Work
- Can your clients manage their own communication preferences and update their own details?
- Are you including a link to your on-line booking system in your SMS & email? What do you mean you don't have online booking?
- Can you target subsets of your clients e.g. senior pets with specific messages?
- Can you send out birthday/lapsed client/vaccine amnesty messages

Dr John McNally from iRecall currently reminds over 150,000 pet owners. "A modern reminder system is key to the health of your clinic. An efficient system can do all of the above un-attended, working quietly in the background day in day out. If you've answered all of the above correctly then you have one less thing to remember," he said.



GENE THERAPY THAT RESTORES VISION IN DOGS MAY HELP HUMANS

A Michigan State University veterinary ophthalmologist has modified a gene therapy that reverses blindness in dogs that have a certain form of a disease known as progressive retinal atrophy, or PRA, and is now looking to advance the treatment for human use.

In an earlier study, the treatment on dogs had a 100 percent success rate in helping them restore their night vision, as well as stop them from losing their daytime vision. The progressive disease, which is similar to a disease in humans, often leads to night blindness, followed by a loss of peripheral vision and eventually total blindness.

Simon Petersen-Jones in the College of Veterinary Medicine has received a five-year, \$8.2 million grant from the National Institutes of Health to further the therapy for people who have a type of retinitis pigmentosa, or RP.

RP is one of the most common inherited diseases of the retina and is estimated to affect about one in every 3,500 people in the United States and in Europe.

PRA is an inherited condition in dogs that results from mutations in the same genes that cause RP. The retina - a thin tissue that lines the back of the eye - has cells that are light sensitive. These cells, called photoreceptors, convert light into signals, which are sent to the brain and give us information about visual images.

With RP, the photoreceptors, rods and cones of the eye are affected and progressively die.

"We know the disease in dogs looks like the disease in humans and progresses in a similar way," Simon said, who is leading the project and is a Myers-Dunlap Endowed Chair in Canine Health.

"We were able to identify a shared gene and create a new therapy that effectively helped dogs see again. This new grant will allow us to build on our primary studies in preparation for an eventual clinical trial in human patients."

Simon and his team were the first to show that some dogs with PRA have a mutation involving a gene called cyclic nucleotide-gated channel b 1, or CNGB1, which also causes a form of RP in humans.

Their approach, which was based on a gene therapy that's been used to treat other inherited retinal degenerations, introduced a



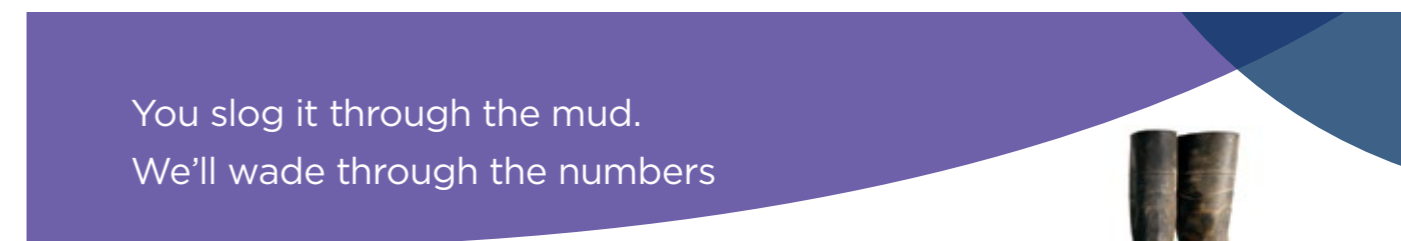
normal copy of the CNGB1 gene into the retina of affected dogs, restoring normal function and vision.

"The therapy works extremely well and we hope that this work will lead to an effective treatment for humans," Simon said.

The team looks to obtain Food and Drug Administration approval to test the gene therapy as an investigational new drug.

Two groups of patients with RP that have the CNGB1 gene mutations, one in the United States and one in Europe, also will be enrolled as part of the project. During this time, researchers will track progressive changes in the patients' retinas that later will be used as baseline measurements to assess the effectiveness of the treatment when it enters a clinical trial.

"We have assembled an outstanding international team of top scientists and clinicians who will be able to collaborate to develop an effective treatment for this form of RP," Simon concluded.



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TREATMENT OF TOOTH FRACTURES BY RESTORATION, DIRECT PULP CAPPING AND EXTRACTION

DR DAVID E CLARKE BVSC DIPLOMATE AVDC FELLOW AVD MANZCVS REGISTERED SPECIALIST, VETERINARY DENTISTRY AND ORAL SURGERY

TOOTH FRACTURES ARE A COMMON DENTAL PROBLEM SEEN IN COMPANION SMALL ANIMAL PRACTICE WORLD-WIDE. FRACTURES MAY RESULT FROM CHEWING HARD ITEMS SUCH AS BONES AND ANTLERS, FENCES AND ROCKS, OR FROM A MOVING OBJECT SUCH AS A MOTOR VEHICLE, GOLF BALL OR SPORTING EQUIPMENT, I.E. CRICKET OR BASEBALL BAT AND GOLF OR HOCKEY STICK.

Fractures may be termed 'uncomplicated' and involve loss of enamel or dentine, or may be 'complicated' and expose the pulp. They may also be limited to the tooth crown, or may extend subgingivally and be termed a 'crown-root' fracture.

Treatment goals are: reducing pulp inflammation and/or infection; eliminating pain; and preventing further damage to the tooth. Treatment options include: extraction; root canal treatment or vital pulp therapy followed by crown restoration.

Many fractures are not observed by the owner at the time of injury due to the pet not showing obvious pain, so immediate therapy is infrequently performed in veterinary practice. The majority of tooth fractures are therefore found by the veterinarian during clinical examination of the oral cavity when the pet is presented for a general consultation, a health check or a vaccination. Because of this, the most common treatment for fractured teeth in veterinary medicine is root canal treatment or extraction.

In this case study, the dog was noticed to be involved in a motor vehicle accident and suffered trauma to the oral cavity, resulting in multiple teeth fractures. The referring veterinarian commenced antibiotics and NSAIDs immediately with the view of reducing inflammation and saving the teeth and the dog was presented at our clinic the same day as the accident.

Case Study

Abbey, a 40kg, 6yo female German Shepherd was referred following presentation at her regular veterinarian after a motor vehicle accident causing multiple fractured teeth on the day of the incident. The referring clinic had commenced Clavulox 500mg IM and Metacam 40mg SQ three hours prior to presentation. The oral examination revealed multiple teeth fractures. A dental chart was completed. The maxillary left 2nd incisor (202) and mandibular left canine (304) had complicated crown fractures. The mandibular left 1st and 2nd incisors (301, 302) had complicated crown-root fractures. There were multiple teeth with uncomplicated crown fractures with dentin exposure: 104, 108, 203, 204, 303, 401, 402 and 403. Clinical examination found Abbey to be healthy - T38.1C, HR 144, RR 12, mentation bright and alert, body condition score 6/9.

Pre-anaesthetic health check using IDEXX in-clinic machines showed the haematology and biochemistry parameters to be normal. Abbey was admitted and intravenous fluid therapy commenced using Hartmann's solution at 5ml/kg/hr after placement of an indwelling #20 catheter in the left cephalic vein. Anaesthesia was administered using buprenorphine 0.35ug SQ and atropine 2mg SQ pre-med followed by alfaxalone 60mg IV induction 30 minutes later. Abbey was monitored during

anaesthesia by measuring blood pressure, spO₂, temperature, heart rate, CO₂ and respiratory rate and kept warm using an air forced heating blanket. The fractured teeth were radiographed using a #2 Sopix sensor prior to treatment. There was an oblique root fracture associated with 302.

Figure 1. View of the rostral mandible showing the fracture to 301, 302 and 304.

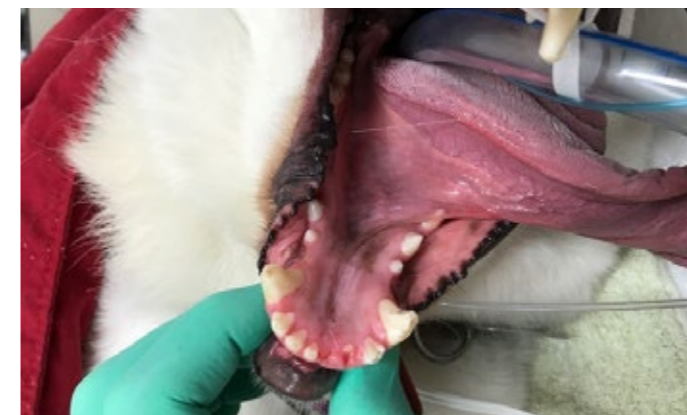


Figure 2. Radiograph of the crown-root fractures of the 1st and 2nd incisor teeth and the apical root fracture of 302.

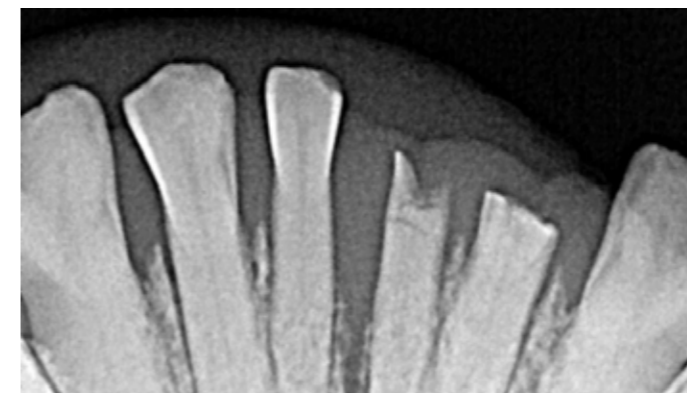
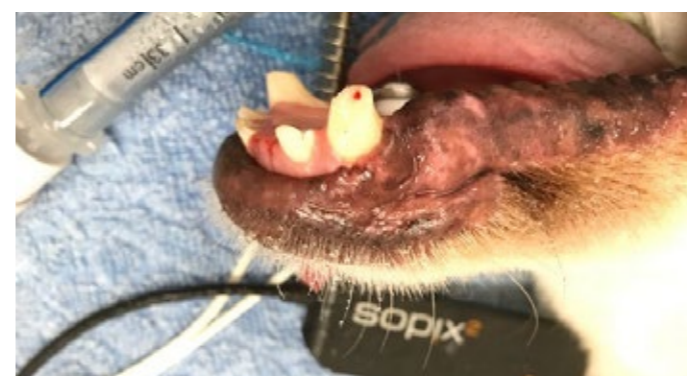


Figure 3. Lateral view of the rostral mandible showing the fracture to 301, 302 and 304.



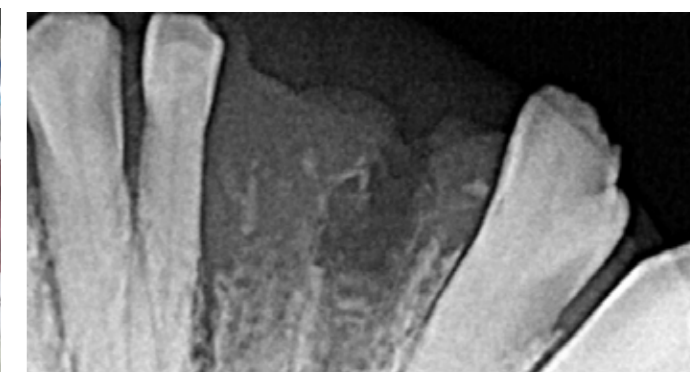
Left sided infra-orbital and mental nerve blocks were placed using 0.5mls mepivacaine 3% solution each. Teeth 301 and 302 were extracted. Teeth 202 and 304 were treated by direct pulp capping. Flowable composite restorative was placed on the teeth with uncomplicated fractures.

Technique for extraction 301 and 302

The epithelial attachment of both mandibular incisor teeth was severed using a #15 scalpel blade placed into the periodontal sulcus. A 1.3S-XS and winged #1 elevator were then advanced subgingivally into the space occupied by the periodontal ligament. Apical progression of the instruments severed the

ligament and loosened the tooth from attachment to the bone with firm but controlled force. Once mobile, the teeth were grasped with small animal extraction forceps and gently removed from the socket with gentle rotation. 301 was removed entire, whilst 302 was missing the root tip. A radiograph was taken to confirm the root tip was still in situ.

Figure 4. Radiograph confirming the root tip of 302 in situ.



An attempt to extract the root tip using the 1.3S-XS and a root tip pick instrument was not successful, so a surgical extraction was performed. Two vertical diverging incisions were made commencing at the gingival margin on either side of the tooth extending into the mucosal tissue to the level of the tooth root to expose the overlying bone. A Molt 2/4 periosteal elevator was used to raise a full thickness muco-gingival flap and expose the underlying bone. Two mm of alveolar bone was removed with a #2 diamond bur in a high speed water-cooled handpiece to the level of the fractured tooth root. The Extract-Eze root tip remover was screwed into the pulp canal of the tooth root to stabilise it and the 1.3S-XS elevator was used to sever the remaining periodontal ligament. Once loose, the root tip remover was used to lift the tooth root from the socket. The gingival flap was replaced and sutured with 4/0 polyglycolic acid. Complete tooth removal was confirmed visually and by radiography.

Figure 5. Radiograph of 302 with root tip remover in place.



Figure 6. Radiograph confirming complete extraction of both 301 and 302.

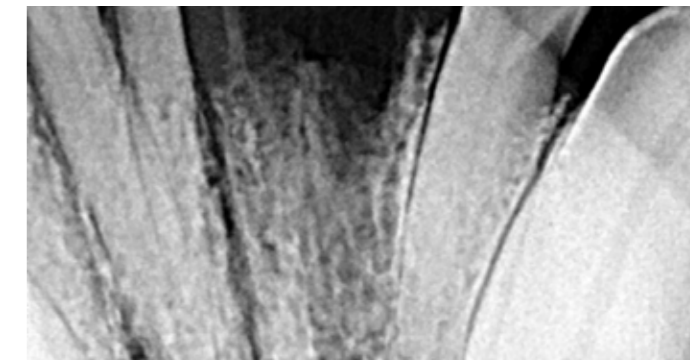
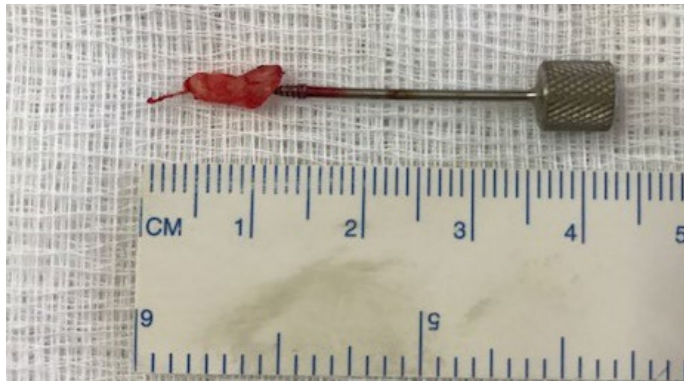


Figure 7. Extracted tooth root attached to the root tip remover.



Technique for direct pulp capping 202 and 304

The teeth were cleaned with a saline soaked swab and sterilised by washing in 0.12% chlorhexidine. A sterile drape was placed over the tooth isolating it from the surrounding tissues and previous surgery site. The exposed infected pulp and 5mm of coronal pulp was removed with a sterile water-cooled #2 round diamond bur in a high speed hand-piece. Haemostasis was achieved with a saline soaked paper point left in contact with the pulp stump for 10 minutes. Once the paper point was removed, hemostasis confirmed and the canal was dry, a 1mm layer of liquid calcium hydroxide paste was placed directly onto the exposed pulp stump using a calcium hydroxide applicator.

A 2mm layer of light-cured glass ionomer was placed directly onto the hardened calcium hydroxide surface and set using a blue curing light. The remaining 2mm of pulp canal and exposed fractured dentine/enamel surfaces were prepared for a composite restoration using the acid technique. 37% phosphoric acid was placed onto the exposed tooth surface using a micro-brush and left for 30 seconds, removed using the same brush, washed with water from the air/water syringe and dried with the same syringe until a frosted appearance. It is important not to dehydrate the surface, which will result in collapse of the intra-tubular collagen and reduced bonding and restorative strength. A thin layer of unfilled composite resin/bond was placed using a micro-brush to the etched tooth surfaces, air thinned using the air/water syringe and cured with the curing light for 10 seconds.

An A1 shade filled composite restorative was placed into the 2mm void within the pulp canal and over the coronal aspect of the fractured tooth using a plastic instrument to provide coverage and protection of the exposed dentine and enamel edges and re-establish normal tooth anatomy albeit to a shortened height. The composite was placed in 2mm increments and cured with a curing light for 10 seconds per cycle.

Once coverage and anatomical form was achieved, the composite was smoothed using Soflex finishing disks commencing with the course disk in a slow speed hand-piece with a mandrel attachment under water cooling from the air/water syringe and progressing through the medium, fine and super fine disks.

A final layer of unfilled resin was placed over the composite and tooth to seal the margin and provide a smooth finish. The resin was cured with the curing light for 10 seconds.

Technique for restorative 104, 108, 203, 204, 303, 401, 402 and 403

The restoratives were performed using composite and the acid etch technique as previously described.

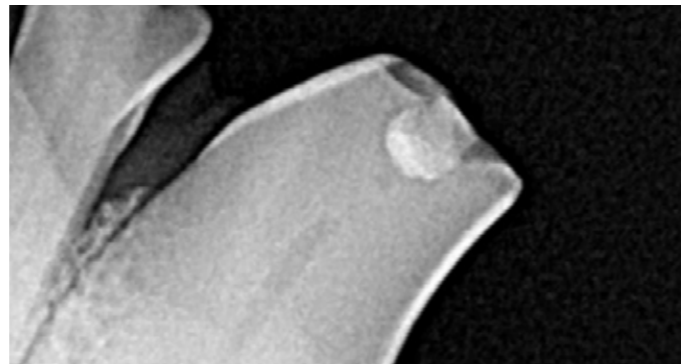
Abbey recovered well from anaesthesia. She was continued on Metacam 40kg body weight oral dose sid and Clavulox 500mg PO bid for 10 days.

Re-evaluation in 3 weeks showed healing of the sutured surgical site and retention of the restorations.

The owner was asked to offer food which could be compressed between the owner's thumb and forefinger, without being mushy until rescheduled radiographs would be obtained of the direct pulp treated teeth.

Follow-up including anaesthesia and radiographs were scheduled and performed five months post-op. Radiographs revealed healing of the extraction sites and formation of a dentinal bridge in the direct pulp capped teeth.

Figure 8. Radiograph of 304 with restorative in place and



Formation of a dentinal bridge.

The procedure of extracting root tips of traumatically fractured teeth can be a challenge. When the tooth roots are located in close proximity to the maxillary and nasal sinus, the mandibular canal, or deep in rostral mandibular bone, the addition of a root tip remover during the extraction process can both make for an easier extraction, as well as, prevent accidental penetration into the nasal cavity and mandibular canal of the tooth root.

Discussion

Direct pulp capping of an acute pulp exposure should be successful as there is minimal chance of pulp infection. A clear understanding of how inflammation in a low compliance system can cause ongoing damage to the pulp becomes critical in the decision making process, so when NSAIDs are commenced immediately post trauma, the pulp should not become inflamed to the point of necrosis.

The alternative to partial coronal pulpectomy and direct vital pulp capping is complete pulpectomy procedure (root canal procedure). In removing the entire pulp from the canal, the odontoblasts are also removed or damaged and dentine will no longer be produced to thicken the dentine layer, narrow the pulp canal and as such strengthen the tooth.

The endodontic debridement of the root canal will further damage and remove intraradicular and intracoronary dentin and cause changes in collagen cross linking and dehydrate the dentin. Published studies show a 14% reduction in strength and toughness of endodontically treated molars in people, resulting in a large relatively brittle canal that is more at risk of fracture than a healthy tooth with a vital intact pulp.

An aesthetic consideration following complete pulpectomy is discolouration of the tooth due to an immature tooth having limited dentin formation. The decision in this case was to perform a direct pulp capping procedure due to the acute nature of the pulp exposure.



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COMMUNITY FOUNDER HONoured WITH GLOBAL AWARD



A Canadian veterinarian and founder of an innovative community outreach charity in Canada, is to receive the World Small Animal Veterinary Association's Health Award. A prestigious global award, it is presented by the WSAVA's One Health Committee (OHC) to an individual or organisation which has promoted an aspect of One Health relevant to companion animals.

Dr Michelle Lem set up Community Veterinary Outreach in 2003. Its veterinary volunteers care for the animals of homeless and vulnerable people but, what sets the initiative apart is that, at the same time, its human health partners provide preventative health care, education and support to their owners. Human health services offered at Community Veterinary Outreach clinics include primary health care, immunisations, harms reduction, smoking reduction and cessation, naloxone training and distribution, and dental and oral care and referral. The charity now runs programs in eight communities across Canada, including Toronto, host city to the 2019 WSAVA World Congress. It recently received non-profit status in the US as Community Veterinary Outreach USA.

Dr Lem is a 2001 graduate of the Ontario Veterinary College (OVC) and has practiced companion animal medicine and surgery in Ottawa and New Zealand. In 2009, she returned to OVC to pursue graduate research at its Department of Population Medicine and obtained an MSc following a research project on the effects of pet ownership on street-involved youth. She served as a member of the Canadian Veterinary Medical Association's Animal Welfare Committee for the last 5 years and is a member of the Canadian Veterinary Reserve. Dr Lem was elected as an Ashoka Fellow in 2013 for her social innovation in providing accessible health care for marginalised populations.

Ashoka is an international organisation that promotes social entrepreneurship.

Commenting, WSAVA OHC Chair Professor Mike Lappin said: "The combination of the veterinary care offered to animals with the preventative health care offered to their vulnerable owners makes Community Veterinary Outreach a very powerful One Health initiative. We congratulate Dr Lem on helping to spread the One Health message and leading by example. Having seen the benefits delivered by her charity, we hope to work with her to bring the Community Veterinary Outreach concept to a global audience, and so provide a positive benefit to animals, individuals and society."

Dr Lem said "Thanks to our dedicated teams of volunteers and community health partners across Canada, we have provided accessible care to more than 4,700 companion animals and 3,800 pet owners and we continue to experience an ever-increasing rise in demand for our services.

"Community Veterinary Outreach's vision is a healthy community in which all members, human and animal alike, have equitable access to quality, preventative, and evidence-based health care and social services. We envision a future in which we work together, across sectors, to eliminate gaps in access to animal and human health and wellness services. We also envision a community that welcomes, empowers and supports marginalised pet-owners as partners on the path towards a healthier community, society and world."

Dr Lem will receive her Award during this year's WSAVA World Congress, which takes place in Toronto from 16-19 July.



Dr Michelle Lem



DRUG REDUCES AMMONIA IN CATTLE WASTE



The Food and Drug Administration and Elanco Animal Health Inc. published separate announcements that say the drug, Experior, can reduce water and air contamination, protecting people and wildlife. It's the first drug approved in the U.S. to reduce gas emissions from livestock, the FDA announcement states.

"Ammonia gas emissions are a concern because they have been implicated in atmospheric haze and noxious odors," the FDA's announcement states. "High concentrations of ammonia can cause irritation of the eyes, nose and throat in both humans and animals."

Ammonia contamination also can cause algae blooms that block sunlight to aquatic plants and starve aquatic animals of oxygen, the announcement states.

Dr Matt Lucia, director of the Office of New Animal Drug Evaluation in the FDA Center for Veterinary Medicine, said in an interview the lubabegron (Experior) approval illustrates that the CVM can approve drugs for environmental benefits, and the agency wants potential drug sponsors to know about it. Agency officials have had conversations with potential drug sponsors about such indications, he said.

Elanco's announcement describes the drug as a pioneering effort to reduce the environmental impact of farming.

"We recognise the impact animal health has on the health of people and the planet," the announcement states.

The drug has only indirect benefits for cattle receiving it. "The evidence that was gathered in studies did not demonstrate any health benefit or performance advantage in beef cattle, such as

weight gain or feed efficiency, as a result of receiving Experior, although no negative effects were noted," the announcement states.

The FDA has approved many drugs for production uses, Dr Lucia said. He cited examples of drugs administered for increased weight gain in cattle, immunologic castration of male pigs, and synchronized estrus in cows.

Lubabegron is a type A beta-adrenoceptor agonist-antagonist, available over the counter. Farmers can administer it in feed to beef steers and heifers for a minimum of 14 days and maximum of 91.

In a study with 336 cattle, researchers showed cattle fed the drug produced 14 to 18 percent less ammonia gas, according to FDA descriptions of the research supporting drug approval. Research on the drug also indicated steaks from treated cattle were less tender, but the change was slight enough that people were unlikely to notice.

Dr Lucia said the researchers who studied lubabegron's effectiveness designed innovative studies, using individual chambers and temporary group structures for cattle, to test whether the drug reduced ammonia release.

"This approval required some pretty in-depth conversations between CVM and the sponsor to come to a product development pathway," he said. "And it's (a) pretty innovative and ingenious, in my opinion, product development pathway."



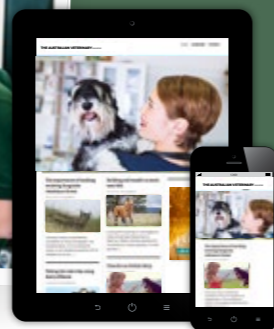


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THE YEAR OF MENTAL WELLBEING



Veterinarians are profoundly passionate about animal health and welfare and embark on their careers with this unwavering driver. These highly skilled professionals have a privileged position in the community as the first-line of response for managing the health and medical treatment of animals.

Being part of one of the most respected professions also comes with the pressures of a profession where veterinarians are not just the animal's general practitioner, but also their surgeon, dermatologist, radiologist and dentist.

Like many other professions, veterinarians are faced with the pressures of their work together with the existing perceived barriers of being unable to openly discuss mental wellbeing, which affects the mental wellbeing felt by some of our colleagues in the profession.

63% of Australian veterinarians are experiencing psychological distress, which makes it more than likely that as many as 3 in 5 are in need of support.¹

In the same way veterinarians care deeply towards their animal patients, they should also have a commitment to their own mental wellbeing and those of their colleagues, so they can continue to carry out our crucial work in the community to the highest standard.

At the Australian Veterinary Association (AVA), we believe that transparent and regular conversations about mental wellbeing in our profession are important, in addition to ensuring that practical support is readily available for veterinarians who are finding it difficult to manage the pressures of the profession.

Our members are always our priority, and we ensure that help is always available for them, including providing a 24/7 AVA counselling service which provides free and confidential support from qualified counsellors for member veterinarians and their immediate families.

All veterinary professionals should continue to actively make a commitment to the mental wellbeing of themselves and colleagues, to not only assist themselves, but those around them to collectively support the mental wellbeing of our profession.

The AVA has developed a Mental Health First Aid program which regularly features in continuing professional development that meets the specific needs of the profession, delivering valuable mental health education to help veterinary professionals identify and respond to colleagues in need of support.

The professional collegiality shared by our members adds another degree of support available for veterinarians, and the extensive support network of like-minded colleagues sharing similar experiences can have a profoundly positive impact.

As we start the new year, the AVA encourages that all veterinary professionals speak openly with their colleagues about mental wellbeing, where possible reach out to the AVA Counselling Service and take part in our Mental Health First Aid program.



Reference

1. Hatch PH, Winefield HR, Christie BA, Lievaart JJ. Workplace stress, mental health, and burnout of veterinarians in Australia. Aust Vet J 2011;89:460-468.

GREAT WHITE SHARK GENOME DECODED

HUGE GENOME REVEALS SEQUENCE ADAPTATIONS IN KEY WOUND HEALING AND GENOME STABILITY GENES TIED TO CANCER PROTECTION.

The great white shark is one of the most recognised marine creatures on Earth, generating widespread public fascination and media attention, including spawning one of the most successful movies in Hollywood history. This shark possesses notable characteristics, including its massive size (up to 20 feet and 7,000 pounds) and diving to nearly 4,000 foot depths. Great whites are also a big conservation concern given their relatively low numbers in the world's oceans.

In a major scientific step to understand the biology of this iconic apex predator and sharks in general, the entire genome of the white shark has now been decoded in detail.

A team led by scientists from Nova Southeastern University's (NSU) Save Our Seas Foundation Shark Research Center and Guy Harvey Research Institute (GHRI), Cornell University College of Veterinary Medicine, and Monterey Bay Aquarium, completed the white shark genome and compared it to genomes from a variety of other vertebrates, including the giant whale shark and humans.

The findings are reported in the 'Latest Articles' section of the journal Proceedings of the National Academy of Sciences.

Decoding the white shark's genome revealed not only its huge size – one-and-a-half times the size of the human genome – but also a plethora of genetic changes that could be behind the evolutionary success of large-bodied and long-lived sharks.

The researchers found striking occurrences of specific DNA sequence changes indicating molecular adaptation (also known as positive selection) in numerous genes with important roles in maintaining genome stability - the genetic defense mechanisms that counteract the accumulation of damage to a species' DNA, thereby preserving the integrity of the genome.

These adaptive sequence changes were found in genes intimately tied to DNA repair, DNA damage response, and DNA damage tolerance, among other genes. The opposite

phenomenon, genome instability, which results from accumulated DNA damage, is well known to predispose humans to numerous cancers and age-related diseases.

"Not only were there a surprisingly high number of genome stability genes that contained these adaptive changes, but there was also an enrichment of several of these genes, highlighting the importance of this genetic fine-tuning in the white shark," said Mahmood Shivji, Ph.D., director of NSU's Save Our Seas Foundation Shark Research Center and GHRI. Shivji co-led the study with Michael Stanhope, Ph.D., of Cornell University College of Veterinary Medicine.

Also notable was that the white shark genome contained a very high number of "jumping genes" or transposons, and in this case a specific type, known as LINES. In fact this is one of the highest proportions of LINES (nearly 30%) discovered in vertebrates so far.

"These LINES are known to cause genome instability by creating double stranded breaks in DNA," said Michael. "It's plausible that this proliferation of LINES in the white shark genome could represent a strong selective agent for the evolution of efficient DNA repair mechanisms, and is reflected in the positive selection and enrichment of so many genome stability genes."

The international research team, which also included scientists from California State University, Monterey Bay, Clemson University, University of Porto, Portugal, and the Theodosius Dobzhansky Center for Genome Bioinformatics, Russia, also found that many of the same genome stability genes in the white shark were also under positive selection and enriched in the huge-bodied, long-lived whale shark.

The discovery that the whale shark also had these key genome stability adaptations was significant because theoretically, the risk of developing cancer should increase with both the number of cells (large bodies) and an organism's lifespan – there is statistical support for a positive relationship of body size and cancer risk



within a species. Interestingly, this does not tend to hold up across species.

Contrary to expectations, very large-bodied animals do not get cancer more often than humans, suggesting they have evolved superior cancer-protective abilities. The genetic innovations discovered in genome stability genes in the white and whale shark could be adaptations facilitating the evolution of their large bodies and long lifespans.

"Decoding the white shark genome is providing science with a new set of keys to unlock lingering mysteries about these feared and misunderstood predators – why sharks have thrived for some 500 million years, longer than almost any vertebrate on earth" said Dr. Salvador Jorgensen, a Senior Research Scientist at the Monterey Bay Aquarium, who co-authored the study.

But the innovations did not end there.

The shark genomes revealed other intriguing evolutionary adaptations in genes linked to wound healing pathways. Sharks are known for their impressively rapid wound healing.

"We found positive selection and gene content enrichments involving several genes tied to some of the most fundamental pathways in wound healing, including in a key blood clotting gene," said Michael. "These adaptations involving wound healing genes may underlie the vaunted ability of sharks to heal efficiently from even large wounds."

The researchers say they have just explored the "tip of the iceberg" with respect to the white shark genome.

"Genome instability is a very important issue in many serious human diseases; now we find that nature has developed clever strategies to maintain the stability of genomes in these large-bodied, long-lived sharks," said Mahmood. "There's still tons to be learned from these evolutionary marvels, including information that will potentially be useful to fight cancer and age-related

diseases, and improve wound healing treatments in humans, as we uncover how these animals do it."

Decoding the white shark genome will also assist with the conservation of this and related sharks, many of which have rapidly declining populations due to overfishing," said Steven O'Brien, a conservation geneticist at NSU, who co-conceived this study. "The genome data will be a great asset for understanding white shark population dynamics to better conserve this amazing species that has captured the imagination of so many."

This research was funded by NSU's Save Our Seas Foundation, the Guy Harvey Ocean Foundation, the Hai Stiftung/Shark Foundation, the Monterey Bay Aquarium, and in-kind support from Illumina, Inc., and Dovetail Genomics.

"Genome instability is a very important issue in many serious human diseases; now we find that nature has developed clever strategies to maintain the stability of genomes in these large-bodied, long-lived sharks."
Mahmood Shivji, Ph.D

NEW RESEARCH PROMPTS WARNING FOR OVERWEIGHT DOGS



Dog owners are being urged to double check their dogs aren't overweight on the back of new research showing that carrying extra weight can shorten a canine's life.

When compared with ideal-weight dogs, the research by the University of Liverpool and Mars Petcare's WALTHAM Centre for Pet Nutrition, found that overweight dogs died up to two and a half years earlier.

Dr Louisa Fenny, a Perth-based veterinarian with national mobile vet service Pawssum Vets, said obesity in dogs was a major issue.

"We're very passionate about helping people ensure their pooch isn't overweight because it can cause unnecessary health complications which can mean people get less time with their beloved pet," said Dr Fenny.

"Australian studies have shown up to 1 in 3 dogs are overweight but, in my personal experience, I believe this number to be even higher as the majority of dogs I see would benefit greatly in losing at least a kilo or two."

Obesity in dogs is associated with an increased risk of painful joint injuries, osteoarthritis, cardiovascular and respiratory disease, heat stroke, diabetes, pancreatitis, liver disease and some cancers. Cats are also at risk of these health problems, along with urinary tract diseases.

Louisa said it was common for owners to be surprised when told their pet was overweight.

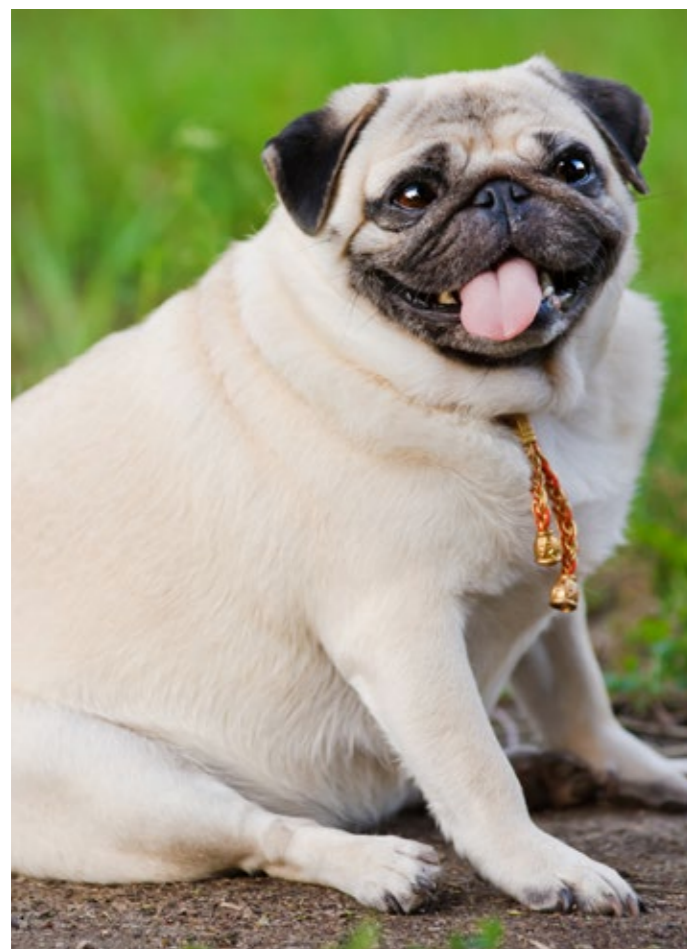
"It's actually a very delicate issue – many owners will become defensive or search for excuses while others will simply laugh it off which, while not unusual, is worrying; we want owners to take it seriously because it impacts their pets' health and happiness," she said.

"Sometimes people whose dogs are the correct weight for their breed and size have been told and believe their pet is underweight or underfed which shows it's common for owners to have a skewed opinion of what is normal.

"To be the correct weight, you should be able to feel your pet's spine and rib cage and they should have a well defined, tucked-in waist line, no matter of how 'large boned' or muscular they are.

"Overweight dogs can have a poorer quality of life and suffer more pain and discomfort than necessary, so keeping your pet at a healthy weight is crucial. The best way to do this is to avoid overfeeding your pet and to exercise them every day."

Results from this latest study of more than 50,000 dogs across 12 popular breeds, conducted retrospectively across two decades, were published in the Journal of Veterinary Internal Medicine.



LAMINITIS RESEARCH TO HELP SAVE HORSES AND PONIES



Laminitis – a complex, common and often devastating disease – is the second biggest killer of domestic horses. Now a body of important research on it has been compiled and shared online for equine vets and others to access.

As knowledge of the pathophysiology, diagnosis and treatment of the deadly condition continues to grow, the Equine Veterinary Journal (EVJ) has published Understanding and managing equine endocrinopathic laminitis, a special online collection of 27 papers and three accompanying editorials compiled by EVJ Associate Editor Nicola Menzies-Gow and QUT's Dr Melody de Laat.

Over the past ten years researchers have made great strides in understanding the pathophysiology of endocrinopathic laminitis. Melody summarised the collection's papers on the links between insulin dysregulation, equine metabolic syndrome (EMS), pituitary pars intermedia dysfunction (PPID) and laminitis.

"We have defined insulin is the key player in endocrinopathic laminitis. We know horses and ponies with EMS and PPID are at an increased risk for developing endocrinopathic laminitis and we have come to understand that it's insulin dysregulation in these animals which is helping to drive the laminitis," said Melody.

She added there was much discussion about the role of obesity in laminitis. A couple of pathophysiology articles in the collection look at the fact that generalised obesity isn't necessarily a factor of endocrinopathic laminitis.

"What's actually going on in the foot of an animal with laminitis is still little understood. Several papers focus on lamellar lesions. Others look at the role that growth factor receptors may play in the disease," Melody said.

"I am really optimistic that within the next ten years we are going to be able to understand the pathophysiology of this condition really well. And then we'll be able to turn our attention to new treatment options for the disease, which will help horses to become pain free."

Nicola editorial reviews the collection's papers on the diagnosis of endocrinopathic laminitis. An accurate diagnosis of laminitis relies on owner recognition of the disease. One of the papers sought to validate this and identified 45% of cases diagnosed by the vet which were not recognised by owners, highlighting the need for better education of owners.

"Detection of insulin dysregulation is essential to identify animals at increased risk of endocrinopathic laminitis so that the preventative management strategies can be focused on these individual animals," says Nicola, who works at the Royal Veterinary College, London.

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HOW CONSERVATION LAW IS FAILING THE BLACK-THROATED FINCH

BY APRIL RESIDE AND JAMES WATSON - THE UNIVERSITY OF QUEENSLAND

NEARLY 20 YEARS AGO, AUSTRALIA ADOPTED NATIONAL ENVIRONMENTAL LEGISLATION THAT WAS CELEBRATED WIDELY AS A BALANCED RESPONSE TO AUSTRALIA'S THREATENED SPECIES CRISIS. IN THE SAME YEAR, QUEENSLAND INTRODUCED ITS VEGETATION MANAGEMENT ACT. TOGETHER, THESE LAWS WERE MEANT TO HELP PREVENT FURTHER EXTINCTIONS.

But have they worked?

We investigated whether these laws had successfully protected the habitat of the endangered southern black-throated finch.

Our study found that, despite being nominally protected under federal environmental law, habitat for the species has continued to be cleared. Just three out of 775 development applications that potentially impacted the endangered southern black-throated finch were knocked back, according to our new research.

Defining exactly what is habitat for the black-throated finch is tricky – we don't have oodles of data on their habitat use over time, and the extent of their sightings has declined substantially. But Queensland has excellent vegetation mapping, and we recorded all of the vegetation types in which the southern black-throated finch has been seen.

We then mapped the extent of this habitat in three different time periods: historically; at the advent of the environmental laws (2000); and current day.

Clear danger

We found that most of the black-throated finch's habitat had been cleared before 2000, mainly for agriculture before the mid-1970s. The black-throated finch hasn't been reliably seen in New South Wales since 1994 and is listed there as "presumed extinct".

We looked at all the development proposals since 2000 that were referred to the federal government due to their potential impact on threatened species. 775 of these development proposals overlapped areas of potential habitat for the black-throated finch.

Only one of these projects – a housing development near Townsville – was refused approval because it was deemed to have a "clearly unacceptable" impact to the black-throated finch.

In addition to these projects, over half a million hectares of the cleared habitat were not even assessed under federal environmental laws.

We estimate that the species remains in just 12% of its original range. Yet despite this, our study shows that the habitat clearing is still being approved within the little that is left.

So in theory, Australia's and Queensland's laws protect endangered species habitat. But in practice, a lot has been lost.

Critical habitat

The highest-profile development proposal to impinge on black-throated finch habitat loss is Adani's Carmichael coalmine and rail project. Adani has been given approval to clear or otherwise impact more than 16,000 hectares of black-throated finch habitat, a third of which Adani deemed "critical habitat" But there are four other mines in the Galilee Basin that have approved the clearing of more than 29,000 ha in total of black-throated finch habitat.

“We estimate that the species remains in just 12% of its original range. Yet despite this, our study shows that the habitat clearing is still being approved within the little that is left.”



Little by little

Our research suggests there is a real danger of the black-throated finch suffering extinction by a thousand cuts – or perhaps 775 cuts, in this case. Each new development approval may have a relatively modest impact in isolation, but the cumulative effect can be devastating. This may explain why a stronger environmental response has not occurred so far.

So how can we prevent the black-throated finch from going extinct? The finch is endangered because its habitat continues to be lost. So its recovery relies upon halting the ongoing loss of habitat - and ultimately, increasing it. Achieving this would require a political willingness to prioritise endangered species protection.

Australia has already lost hundreds of its unique plants and animals forever. In just the last few years, we have seen more mammals and reptiles disappear to extinction. If we continue on our current path, the southern black-throated finch could be among the next to go.



But it's not just the mines. In 2018 the federal government approved clearing of black-throated finch habitat for a housing estate and a sugar cane farm, both near Townsville. Several solar farms have also been proposed that would clear black-throated finch habitat around Townsville.

To further complicate matters, the black-throated finch's habitat is also threatened with degradation by cattle grazing. The finch needs year-round access to certain grass seeds, so where grazing has removed the seeding part of the grasses, made the ground too hard, or caused the proliferation of introduced grasses such as buffel, the habitat suitability can decrease until it is no longer able to support black-throated finches.

So while they are losing their high-quality habitat to development, a lot of their habitat is being degraded elsewhere.

The federal government has placed conditions on approved clearing of black-throated finch habitat, often including "offsetting" of any habitat loss. But securing one part of the black-throated finch's habitat in exchange for losing another still means there is less habitat. This is particularly problematic when the lost habitat is of very high quality, as is the case for Adani's Carmichael coalmine lease.

CATTLE PREGNANCY TESTING SHOULD BE VET-ONLY FOR ACCURACY



Pregnancy diagnosis in cattle for fee and reward must be retained as an Act of Veterinary Surgery and performed only by registered veterinary surgeons says the President of the Australian Cattle Veterinarians, Dr Alan Guilfoyle. Lay operators compromise animal welfare and accuracy. In contrast, the use of registered veterinarians protect the integrity of Queensland and Australia's cattle industry, which was worth \$7.1 billion in 2016-2017.

Pregnancy diagnosis requires both a manual rectal examination of the reproductive tract and ultrasound methods to determine the stage of pregnancy. It is an invasive procedure that can seriously harm animals if not performed correctly. Inaccurate diagnoses not only affect farm productivity, but also can cause catastrophic welfare issues if exported animals calve on board on live export vessels.

The Australian Cattle Veterinarians (ACV) are a special interest group of the Australian Veterinary Association (AVA), and have a PREGCHECK™ scheme which is proven to be more accurate and reliable than any other method of pregnancy testing.

“Under our scheme, only vets accredited to the PREGCHECK™ protocols are able to apply tags, so when you buy or sell a cow or heifer you know it's been tested by a PregCHECK™ vet.”

The scheme has also increased the level of integrity and confidence of the Australian live export trade,” Alan said. The PREGCHECK™ protocols have been place for over thirty years and constantly revised to make it a scheme of highest integrity.

When a vet is on the farm performing pregnancy testing, farmers get extra benefits in addition to providing high-levels of accuracy and accountability. These include conversations about animal health and production, disease and biosecurity-related matters, and the early detection of disease. Often these diseases which have been lowering productivity over a period of time go undiagnosed. Only a veterinarian has the breadth of training and knowledge to value-add in this way.

If lay pregnancy testing is allowed, let it be very clear that there will be a loss of vets from regional and remote Queensland. In times of drought and other adverse weather events, there will be fewer vets to discuss welfare options in these locations. In Northern Australia, pregnancy testing of cattle may be the only time a vet is on the farm and this is critical for surveillance and lowering the risks of serious exotic diseases such as Foot and Mouth Disease.

“We're very proud to support the profitability and sustainability of the Queensland beef and dairy industries with our PREGCHECK™ scheme,” Alan said. “We urge the government to retain pregnancy diagnosis as a vet-only procedure to ensure ongoing best outcomes for industry”.

NEW METHOD TO TREAT LIFE-THREATENING HEART ARRHYTHMIAS IN DOGS

Morris Animal Foundation-funded researchers have developed a new treatment for dogs with a rare, but life-threatening, arrhythmia caused by atrioventricular accessory pathways (APs). The minimally invasive technique, which uses radiofrequencies, is modified from a human cardiology procedure and has a more than 95 percent success rate in treating dogs with this type of arrhythmia.

The technique, radiofrequency catheter ablation (RFCA), was adapted by Dr. Kathy N. Wright and her colleagues at MedVet, a family of emergency and specialty veterinary hospitals around the United States. The team published their findings in the Journal of Veterinary Internal Medicine.

“Accessory atrioventricular pathways are one of the more common causes of rapid heart rhythms in young dogs and we were pleased to prove they are curable with radiofrequency catheter ablation,” said Dr. Wright. “The dogs can then go on to have their hearts recover and be off all heart drugs within a period of three months, and then go on to live normal lives.”

APs are abnormal electrical circuits in the heart that can become activated and overcome the heart's normal current pathways, severely impairing its ability to pump. RFCA uses radiofrequencies to destroy those rogue circuits and allow the heart's normal function to resume.

“Kathy study demonstrated that radiofrequency catheter ablation is a safe and highly effective alternative to lifelong medications and repeated veterinary visits for dogs,” said Dr. Kelly Diehl, Interim Vice President of Scientific Programs at Morris Animal Foundation. “Even better is that it's a long-term solution for a problem that can be fatal if left untreated.”

In this study, the team used RFCA to treat 89 dogs with AP-related arrhythmia. While 23 breeds were represented, more than half of the patients were Labrador retrievers, as APs are more prevalent in that breed. The researchers threaded a catheter into each dog's heart and then delivered radio waves toward the APs.

Each dog was monitored with telemetry for at least 16 hours after the procedure and before they were discharged. Within two months, the dogs' heart activity was measured to determine the procedure's effectiveness. In all but three dogs, initial treatment with RFCA cured the arrhythmia. The remaining dogs were cured with a second treatment.

Once considered relatively harmless rhythm disturbances, APs are now known to cause rapid heart rhythms that can result in congestive heart failure or sudden death. Symptoms can include extreme fatigue and gastrointestinal distress, including lack of appetite and vomiting. These symptoms are similar to other common health problems in dogs, making the condition difficult to diagnose. It's not known how APs are created.

PLANNING, TECHNOLOGY A MUST FOR AGEING PET OWNERS



Taking care of a pet can become a more difficult task as we age but with a bit of planning, owning one can still be an incredibly rewarding experience, according to Australian veterinarian Dr Louisa Fenny.

Dr Fenny, the WA state manager for national mobile vet service Pawssum Vets, said whilst getting older brought new considerations for owning a pet, it was not necessary for people to give up their furry friends.

“As people begin to experience health issues such as arthritis or knee or back pain, for example, it can affect their ability to walk their pet and some owners worry about forgetting to take them to the vet for their regular health checks and vaccinations,” she said.

“While these are issues that need to be considered, the mental and physical benefits of owning a pet are so great that it's worth looking at ways to keep them in your home for as long as possible.”

Dr Fenny suggested finding a friend, family member or volunteer to specifically help you care for your animal – and also highlighted the benefits of embracing technology in supporting pet care.

“A pet buddy is someone who helps you remember to walk and feed or give medications to your dog or cat, ensures they're getting enough water and checks they're in OK general health,” she said.

“New technology can also make it easier to care for pets – for example, you can use mobile phones to set daily feeding and walking reminder alarms, you can use websites or apps like Pawssum to book mobile vets to come to your home, avoiding the need to travel if mobility is hard for you and reducing the stress for you and your fur baby.

“And you can keep all your pet's health care details online with the Pawssum app so there's no need to have to recall specific medication names or dosages or dates of vet visits.

“These days you can also get SMS or email reminders for regular vaccinations and health checks which reduce the chances your pet's health will be put at risk.”

Dr Fenny said when considering buying a new pet, there were better options for ageing owners – and Pawssum vets could provide information to support your decision.

“If you have mobility problems, it's important to get a pet that doesn't require as much exercise, for example elderly dogs in need of a home, along with elderly cats,” she said.

“But do get a vet to do a full health check when getting an older pet to ensure they're well as a sick pet can be costly.”

And Louisa pointed out that a growing number of aged care facilities were now accommodating dogs and cats.

“So if a move is on the cards and you want your pet to come with you, do your research and seek out one where your fur baby is welcome too,” she said.



ESPERANCE ABORIGINAL RANGERS AID STARLING CONTROL ON WA'S SOUTH COAST



Western Australia's annual pest starling surveillance and management program on the WA/South Australian border and south coast has been complemented over recent months with local community involvement.

The Department of Primary Industries and Regional Development has employed Esperance Tjaltjraak Native Title Aboriginal Corporation Rangers to assist biosecurity officers in starling trapping east of Esperance.

Department biosecurity officer Darren Dixon said the common starling (*Sturnus vulgaris*) was an invasive bird pest which had established in many countries outside its natural range of Europe, Asia and North Africa.

"Starlings feed on cultivated grain and horticultural crops, disperse weeds, foul wool and can displace native birds," Darren said.

"Since 1971, the department has run an ongoing trapping and surveillance program in the south-east of the State to prevent the encroachment of the pest birds from South Australia, where this introduced pest has established."

"The employment of Tjaltjraak rangers has enabled enhanced trapping over the October to December period to coincide with the fledgling of juvenile starlings."

Over the past 10 years, the average number of starlings trapped in Eucla has been from 42 to 45, with 161 trapped last season.

Darren said since August 2018, 55 starlings had been trapped at Eucla, indicating the 2018/19 season was likely to yield a higher than average result, prompting the placement of 72 traps from west of Hopetoun to east of Condingup, across 7,000km².

"Because the threat of starlings into WA is constant, the department recruited and trained Tjaltjraak rangers to undertake trapping using live lure birds at strategic locations near Esperance," he said.

"Feral animal management is an aspect of the State Government's Aboriginal Ranger Program to create jobs and training and community development opportunities."

Starlings are small to medium-sized birds. They have distinctive glossy black feathers with an iridescent green and purple sheen. From a distance they can look plain black.

Young birds, seen mainly in spring and summer, are a mouse-brown colour. When they moult to adult plumage in autumn they have a patchy brown and black appearance, often with some pale spotting.

Community members are encouraged to report any unusual activity, such as birds on the back of livestock or groups of black birds flying in tight groups, particularly in the Munglinup, Hopetoun and Esperance areas.



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94.5%
DOG APPROVAL
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- It's easy to administer and the weight calibrated syringe ensures accurate dosing at all times
- With high acceptance by dogs¹, excellent adherence to treatment can be expected²
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