

# VET CANDY

JANUARY 2022

**MOM  
LESSONS**

SARS-COV-2 VARIANT  
DETECTED IN DOGS  
& CATS WITH  
**SUSPECTED  
MYOCARDITIS**

NEW  
VACCINE  
PROTECTS  
AGAINST  
**VALLEY  
FEVER**

CAT OWNERS'  
PERCEPTIONS  
**DURING THE COVID-19  
PANDEMIC**

ARE YOU  
**OVERWHELMED?**  
**CHECK  
THESE TIPS!**

Making family a priority

**DR. KATHRYN  
SLAUGHTER MEHFOUD**

**+** much more



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BRAVE AND BOLD LIFE**

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**DR. JILL LÓPEZ**  
Editor-in Chief

**ANTONIO LÓPEZ**  
Creative Director

**SHANNON GREGOIRE**  
Assistant Editor

**MOHAMMAD ALAUDDIN**  
Layout Designer

**AMANDA COFFIN**  
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**A.M. KUSKA**  
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**TATIANA ROGERS**  
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Food Editor

**ARLENE TORRES**  
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**GISELLE RICHARDSON**  
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Chief Executive Officer  
**DR. JILL LÓPEZ**

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# Welcome to the world of *Vet Candy*

By Dr. Jill Lopez

We are all familiar with New Year resolutions. We vow to lose weight, or get a new raise at work. However, sometimes we are so busy chasing these smaller goals we fail to look at the big picture. Life goals are the big goals in life. The goals that define who we want to be as people, and what we want out of our lives.

In this issue, we are introducing you to Dr. Kathryn Slaughter-Mehfound, someone who has been checking off the boxes of many of her

life goals, including getting married, completing a residency, having a baby, and starting a new life in Kentucky. Dr. Kathryn is a board certified equine surgeon who recently completed a residency at the University of Illinois, during which, she was pregnant with her first child, Caroline.

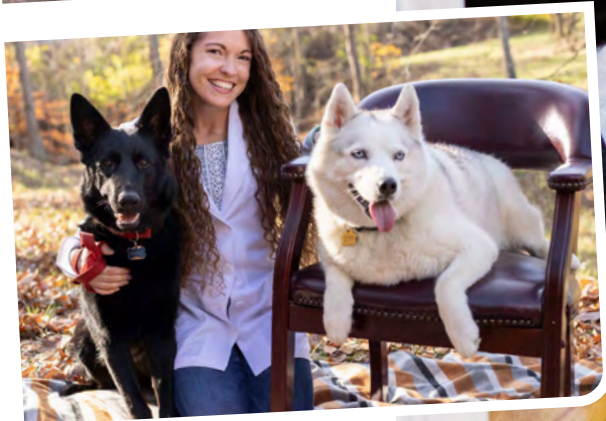
We also have some other great information in this issue that will help you live your best life.



# Dr. Kathryn Slaughter-Mehfoud's brave and bold life

Being a veterinarian is not always easy, but the rewards of our profession are plentiful. This is especially true for Dr. Kathryn Slaughter-Mehfoud, who looks forward to making the horse world a better place.

A native of Lexington, North Carolina, Dr. Kat is living her dream as a veterinarian, a dream which started at a very young age. Of course, she owes much of her drive to her





parents, who were extremely supportive in fostering her passion.

A veterinary graduate of Western University, Dr. Kat went on to attain her master's degree in Public Health from the University of Minnesota and completed an equine surgery residency at the University of Illinois.

She is living her dream life in Kentucky with a new job and a new farm. Dr. Kat makes sure to keep herself balanced outside of work – a big part of that is focusing on her family.

Two years ago, she married the love of her life, Collins. The two met while she was pursuing her undergraduate degree at Virginia Polytechnic Institute & State University. They had their first child, Caroline, last November.

For Dr. Kat, the sky is the limit and more is yet to come. What's her plan? To continue pushing through the tough times, both big and small, and enjoy the simple things in life.





# Are you overwhelmed with demand for your services?

By CJ Burnett and Tom Seeko

In the world of pet care, it's easy to get overwhelmed. It seems there is always another animal in need or a pet owner who could use our help and advice. Veterinarians know better than most just how busy a practice can get, especially during times of reduced staff/pandemic capacity limits! If these struggles sound familiar, you're not alone. Read on to discover three brilliant ways veterinarians can handle having too much business.

# The 3 E's: Efficiency, Expansion, Extra Help

You are at capacity.

Every day, your practice is turning away new patients because you simply don't have the resources to accommodate them. It's a constant battle to deal with your current caseload of pets that all need help right now vs. who can be seen later. Staff are exhausted, overworked, and falling apart. But the problem isn't necessarily them (or you). No. Instead, the real issues stem from a lack of time and resources.

So, what to do?

The answer lies in efficiencies and/or expansions!

1

## Efficiency

The first smart way to handle having too much business is to become more efficient. Examine your daily processes. Ask yourself:

- Where can time be saved?
- How long am I spending per case?
- Who oversees each step of the process when a case is being worked on?
- Are there redundancies in the ways patients are handled?
- Do staff move cases efficiently throughout the process?
- Are there costs that are unnecessary that can be reallocated?

Thinking about these questions opens up the possibility of finding more efficient ways to accomplish tasks.

2

## Expansion

The second way to handle too much business as a veterinarian is to expand. To do so, start by reflecting on what capacities in your practice are maxed out. For example:

- Do you have too few exam rooms?
- Can your floor layout be reorganized?
- Do you have too few veterinarians? Vet techs? Office staff?
- Is the waiting area crowded?
- What time is busiest? Morning or afternoon?
- Could opening a second location nearby be a viable option?

3

## Extra help

A third way to handle too much additional business is to get extra help, and that means utilizing telemedicine platforms. Refer non-urgent matters to a trusted telehealth company who can speak with your client immediately and give them peace of mind.

Telemedicine gives your clients answers right away and frees your team up for appointments that must be seen in person. Telemedicine triage can help you be able to accept new patients, keep the old ones happy, and stay healthy yourself by becoming more efficient.





## Say “Yes!” to More Business Without Burning Out

Above all, the goal should be to provide expert, compassionate, timely service to our patients without working our team so hard that they can't keep up with demand. Remember that veterinarians are particularly vulnerable to burnout. In fact, Veterinary Integration Solutions just released results from a survey that indicated that the burnout rate has increased in the veterinary profession, with the younger professionals being the most burned-out group.

The solution? Be more efficient, expand, and get extra help!

- ✓ Want more great tips?
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- ✓ Smarter Veterinary Podcast

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# 5 secrets to balancing pregnancy and your career

Dr. Kathryn Slaughter-Mehfoud

"Keeping a water bottle close by will help you stay hydrated, which is extremely important for your growing baby"



**1** Get up early and get your work, home, and personal responsibilities done before dinner. Pregnancy is tiring so it's essential to be organized and efficient with your responsibilities so you get enough rest and sleep.

**2** Save your sick days and vacation days to use after the baby is born. Although you will be offered maternity leave, taking a long maternity leave will only increase the duration of your residency, which equals less pay for longer and delaying your career.

**3** Have a wonderful support system at home. I couldn't ask for a superior life partner and family to support me through my pregnant residency journey. Having an encouraging, loving, and supportive spouse is essential.

**4** Drink water regularly. Our careers are physically demanding and you routinely go from one case to another without the chance to ever sit down for a 5-minute lunch or take a break. Keeping a water bottle close by will help you stay hydrated, which is extremely important for your growing baby.

**5** Embrace the scrub life! Fortunately for me, I didn't start showing or gaining weight until about 22 weeks pregnant. Once the baby bump starts protruding, it can make your regular work clothes



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# **THIS DOG PARASITE IS DEVELOPING RESISTANCE TO TREATMENTS**

Hookworms are one of the most common parasites plaguing the companion animal world.

They use their hooklike mouths to latch onto an animal's intestines, where they feast on tissue fluids and blood. Infected animals can experience dramatic weight loss, bloody stool, anemia, and lethargy, among other issues.



Now they've become multiple-drug resistant, according to new research from the University of Georgia.

Right now, U.S. veterinarians rely on three types of drug to kill the hookworms, but the parasites appear to be becoming resistant to all of them.

Researchers from the UGA College of Veterinary Medicine first reported this concerning development in 2019, but new research, published recently in the *International Journal for Parasitology: Drugs and Drug Resistance*, provides deeper insight into where the problem started and how bad it's since become.

For the present study, the researchers focused on current

and former racing greyhounds. Dog racetracks are particularly conducive to spreading the parasite due to the sandy ground of the facilities, an ideal breeding ground for hookworms. Because of the conditions, all the dogs are dewormed about every three to four weeks.

After analyzing fecal samples from greyhound adoption kennels, three veterinary practices that work with adoption groups, and an active racing kennel, the researchers found that the parasites were highly prevalent in the breed. Four out of every five greyhounds tested came up positive for hookworms. Additionally, the ones that tested negative are probably

also infected, said Ray Kaplan, the study's corresponding author and a former professor of veterinary parasitology at UGA. Hookworms can sometimes "hide" in tissues, where they won't reproduce or shed eggs until the infection worsens and leaks into the dog's intestines.

But perhaps more alarming, the team saw that the dogs still had high levels of infection with hookworms even after they were treated for them.

The study marks the first demonstration of widespread multiple-drug resistance in a dog parasite reported in the world.

## Parasite mutations

In situations where there are a lot of dogs infected with a lot of parasites, such as on racing dog breeding farms and kennels, there are many more opportunities for parasites to develop rare mutations allowing them to survive the de-wormer treatments. If de-wormers are applied frequently, the newly emerging resistant worms will survive and pass on the mutation that helped them sneak past the drug to their offspring.

With repeated treatments over time, most of the drug-susceptible worms at the farm or kennels will be killed and the resistant worms will then dominate.

Compounding the problem,

veterinarians don't typically test animals after treatment to ensure the worms are gone, so the drug-resistant worms go unnoticed until the dog has a heavy infection and starts showing signs of hookworm disease.

The researchers found that almost all the fecal samples tested positive for the mutation that enables hookworms to survive treatment with benzimidazoles, a broad-spectrum class of de-wormers used in both animals and humans. Although a molecular test does not yet exist to test for the resistance to the other two types of drugs, other types of testing by the team showed that the hookworms were resistant to those drugs as well.

"There's a very committed greyhound adoption industry because they are lovely dogs," said Kaplan. "I used to own one. But as those dogs are adopted, the drug-resistant hookworms are going to show up in other pet dogs."

One possible breeding ground for a potential drug-resistant hookworm outbreak is also the place many dog owners use to exercise their animals: dog parks.

"Personally, I would not take my dog to a dog park," Kaplan said. "If your dog picks up these resistant hookworms, it's not as easy as just treating them with medication anymore. Until new types of drugs are available, taking your dog to a dog park has to be considered a risky activity."

## The consequences

Dogs don't have to ingest the worms to become infected. Hookworm larvae live in the soil and can also burrow through the dog's skin and paws. Additionally, female dogs can pass the parasite on to their puppies through their milk.

If that's not scary enough, dog hookworms can also infect humans.

The infection doesn't manifest in the same way in people, but after the worms penetrate the skin, they cause a red, very itchy rash as they travel under the skin. As the number of drug-resistant worms grows, they'll also pose a risk to humans.

Previously, doctors would treat patients with an ointment that contains a de-wormer along with a corticosteroid. "Unfortunately, that's not going to work

against these drug-resistant hookworms," Kaplan said.

But hope isn't entirely lost.

Kaplan and Pablo Jimenez Castro, lead author of the study and a recent doctoral graduate from Kaplan's lab, found in another recent study that these multiple-drug resistant dog hookworms do appear to be susceptible to emodepside, a de-wormer currently only approved for use in cats in the U.S. However, use of this cat drug on dogs should only be performed by a veterinarian, as it requires veterinary expertise and supervision.

Based in part on Castro's work, the American Association of Veterinary Parasitologists recently formed a national task force to address the issue of drug resistance in canine hookworms.





# The high cost of a veterinary degree leaves many of us with unpayable debt

By Shannon Gregoire

The [Wall Street Journal](#) released an article chronicling the increasing struggles of high cost professional degrees such as veterinarians and dentists and the extreme high debt load attached to those careers. The WSJ found 76% of professional programs leave grads with more debt than earnings after 2 years on the job.

Over the last twenty years, average veterinarian debt has tripled. According to the [AVMA](#) the class of 2019 had an average of \$183,302 in loans, while the mean veterinary salary is only \$99,250 (Bureau of Labor Statistics). And \$183,302 is the

average debt, some students have loans in excess of \$400k.

The biggest issue we are facing as new graduates is the gap between our starting salary and our massive debt burden. While the burden is greatest in areas such as San Francisco, Boston, and New York City where there is an extremely high cost of living, the struggle to repay loans while living our life is real.

At the same time, tuition rates for veterinary college are at an all-time high. The [Association of](#)



American Veterinary Medical Colleges Students reported that the average tuition rate in 2019 was \$31,979 for in-state and \$52,613 for out-of-state tuition. I am very concerned about the future of our profession and I feel high tuition rates, along with the increased ability to secure federal student loans, are leading us down a slippery slope.

So, what is our future like as

new graduates? Yes, there are programs like loan forgiveness, but that means large monthly payments for the next 20-25 years, the remaining debt is “forgiven” to the individual, while still leaving a large tax burden on the individual. New grads are also likely to choose their jobs solely based on the pay rate, which means many rural areas where the pay rates are lower will be left in dire need of veterinary services. We are already seeing veterinary

deserts across the nation and it can only get worse.

Another issue that we face is that those with these massive debt burdens are less likely to continue their education to become specialists, since specialty training programs have an average salary of \$35,807 (AAVMC) per year. Granted, some loan repayments can be deferred while you are pursuing a specialty, but the interest on the loan continues to grow.

With the pressure of our debt burden and the need to make a living, we also often have to choose to postpone life events like buying houses, starting our own business, getting married, or having children, not to mention saving for retirement. How many of us are missing out on living our best life because of our debt? I am saddened by the current state of our profession and that these highly trained professionals are being forced to make these decisions.

Surprisingly, even with student loan debt climbing higher, veterinary school applications keep climbing year after year, with a recent average being about 11,000 applicants for about 4,300 total seats. I agree with the WSJ article when they say that a veterinary career choice is an emotional one, some of us will make bad financial decisions to have the career of our dreams.

What is the solution? A solution to this issue is neither clear nor easy. Concerning debt on a personal level, Tom Seeko, owner and financial





advisor with [Florida Veterinary Advisors](#) says that “the first step to managing student loan debt is understanding how much you owe and to whom.” From that point, you can learn more about repayment options and make a plan.

But, we need a better solution for our entire profession, for now and for the next generation of veterinary professionals. What if we could pause interest on student loans until after graduation or have states sponsor full tuition for students who agree to return to that state to practice? What about decreasing tuition rates and increasing residency salaries? What about expanding the [Health Professions Scholarship](#) program through the military? The Health Professions Scholarship program covers tuition and living expenses but currently offers less than a handful of spots each year.

I am hoping that change happens soon and that this article from WSJ sheds light on a crisis that is happening across our profession and helps bring about real change.

# SARS-CoV-2 variant detected in dogs and cats with suspected myocarditis

A new study in the *Veterinary Record* reveals that pets can be infected with the alpha variant of SARS-CoV-2, which was first detected in southeast England and is commonly known as the UK variant or B.1.1.7. This variant rapidly outcompeted pre-existing variants in England due to its increased transmissibility and infectivity.

The study describes the first identification of the SARS-CoV-2 alpha variant in domestic pets; two cats and one dog were positive on PCR test, while two additional cats and one dog displayed antibodies two to six weeks after they developed signs of cardiac disease. Many owners of these pets had developed respiratory symptoms several weeks before their pets became ill and had also tested positive for COVID-19.

All of these pets had an acute onset of cardiac disease, including severe myocarditis (inflammation of the heart muscle).

“Our study reports the first cases of cats and dogs affected by the COVID-19 alpha variant and highlights, more than ever, the risk that companion animals can become infected with SARS-CoV-2,” said lead author Luca Ferasin, DVM, PhD, of The Ralph Veterinary Referral Centre in

the UK. “We also reported the atypical clinical manifestations characterized by severe heart abnormalities, which is a well-recognized complication in people affected by COVID-19 but has never described in pets before. However, COVID-19 infection in pets remains a relatively rare condition and, based on our observations, it seems that the transmission occurs from humans to pets, rather than vice versa.”





# Mom Life, 10 Lessons to Live By

by Dr. Jill Lopez

If you have recently joined the mom club, congratulations. This is the best and most noble job you'll ever do, but it's also the hardest. You will cry, laugh, feel proud, regret, and even curse from time to time. Mom life will test you to the core and show you what you are made of. From veteran moms who've been there to you, here are ten lessons to live by as a mom.

## **This too shall pass**

Does it feel like the colic cries, the late nights, and the puking will last forever? It won't. Everything

you are going through now will pass, and soon. Give it a little more time because you are about to conquer it.

## **Enjoy every moment**

Did we say everything shall pass? That includes the cute and cuddly moments. Take time to enjoy every sweet moment with your child because it only lasts a short time. Soon you will be missing that baby smell and having them lay on your chest. Slow down and enjoy every moment with intention.



## Nobody's perfect

Do you look at all the moms around you and think they look like they have their stuff together? They don't. Every mom goes through it. Every mom feels like they are losing their mind, and you are not the only one who hasn't showered in two days. Take it easy, forgive yourself daily and know that what you are seeing out there is all fake.

## Keep it simple

As a mom of young kids, now is not the time to cook gourmet meals and set the table like a hotel. Make a simple meal plan you can whip up in minutes, keep everyone's dressing simple, and remove anything that takes you extra time from your roster.

## Be a parent first, a friend second

As a mom, you will constantly struggle between being a friend to your kids and being a parent. When this question pops up, always choose to parent first. Your job is to mold these kids to be responsible human beings, and only a parent can do that. If you parent with love and patience, friendship will grow naturally, and there will be a balance between the two.

## Remember your relationships

Last but not least, don't neglect your relationships. Your relationship with your spouse, best friends, and family is what fills you up and makes you happy. Make time for these relationships, even if it's during your one hour off, and have yourself some love.

## Take time for you

They say you can't give from an empty basket, and moms do a whole lot of giving. Take some time to refill now and then. An hour a day for you is enough to prevent post-partum manic and fatigue. Go for a walk, take a candle-lit bath, have some wine and watch an episode of friends alone or simply go for a pedicure. Just do you.

## Take a lot of pictures

That moment when your baby says dada, takes their first step, laughs out loud, or learns how to crawl happens only once. Within a year, nobody will remember how awesome that was. Take time to record every moment on camera because memories are what life is made of.

## Every child is different

If you have multiple kids, remember they are completely different. Their personalities are different, their behavior is different, and how they react to things is different. The worst mistake parents make is to compare two children, especially in their presence. Learn what makes them different and treat them as individuals.

## Don't be afraid to ask for help

Children are exhausting. If you have doubts, look at the statistics of all the moms who get post-partum depression. Ask for help when you feel overwhelmed. Call your mom, call your friends, hire a nanny, and most importantly, ask the dad for help. Trust us, there is no shame in asking for help.

# Cat owners' PERCEPTIONS during the COVID-19 pandemic



Researchers evaluated the impact of the COVID-19 pandemic on the welfare of pet cats, as well as the owners' experience in relation to their cat(s).

An online survey containing 21 questions was distributed internationally. Survey questions were related to cat behavior and health. The survey was completed by 324 respondents from 25 different countries.

The survey showed that keeping pet cats during the pandemic was not problematic for the owners, except some noted difficulties accessing veterinary care. The majority (67.3%) of respondents reported no changes in their cats' behavior. When behavioral changes were noted, they were mostly a positive change.

Two-thirds of the respondents reported reduced psychological tensions due to having a cat during the pandemic.

*Read more by clicking on the link below:*

[Cat owners' perception on having a pet cat during the COVID-19 pandemic](#)

# Small ways to practice self-compassion

By AM Kuska

When it comes down to forgiving others, many of us are pretty good about it. Whether we comfort a child after breaking a glass, or reassure our coworker their mistake is fine, we are often very good at showing compassion to others.

One person, however, most of us are genuinely not good at showing compassion to is ourselves. We are often extremely self-critical of our smallest flaws and hold up an ideal of utter perfection as the only acceptable standard we are allowed to achieve. If this is you, here are a few ways you can show yourself more compassion.

## Treat Yourself Like You'd Treat a Friend

You would never tell your friend they're a disgusting fat blob, they're lazy, they're ugly, or any number of things you might think to yourself. You wouldn't even tell a stranger these things. You owe it to yourself to treat yourself with at least the same kindness you treat your friends.





## Adopt a Growth Mindset

If you chalk up every success you see in others to natural talent or some other statistic you can't yourself achieve, you won't reach the heights you are truly capable of. A growth mindset opens you up to the possibility that you really can achieve anything you want in life.

A growth mindset is truly one of the most compassionate things you can do for yourself, because it helps you to avoid limiting yourself.

## Remember, it's not a race

It's very easy (and dangerous) to compare yourself to others. Remember that the only one you should be comparing yourself to is your old self. If others are achieving things faster than you, that's their path – not yours. By focusing only on bettering yourself, you can take the pressure off of your success.

Self-compassion is critical to getting the most out of life. By caring a little about yourself and valuing yourself, you can change your quality of your life – and also how much success you have.



# 7

personality  
and  
behavior  
traits  
identified  
in cats



**Researchers at the University of Helsinki have developed a new comprehensive questionnaire for surveying feline personality and behavior. A dataset of more than 4,300 cats representing 26 breed groups revealed seven personality and behavior traits, with significant differences observed between breeds.**

Cats are our most common pets and feline behavior is increasingly being investigated due to a range of behavioral problems. Another topic of interest in addition to behavior traits is personality, since it can be connected to behavioral problems.

“Compared to dogs, less is known about the behavior and personality of cats, and there is demand for identifying related problems and risk factors. We need more understanding and tools to weed out problematic behavior and improve cat welfare. The most common behavioral challenges associated with cats relate to aggression and inappropriate elimination,” says doctoral researcher **Salla Mikkola** from the University of Helsinki and the Folkhälsan Research Center.

## Seven feline personality and behavior traits

In a questionnaire designed by Professor **Hannes Lohi**'s research group, personality and behavior were surveyed through a total of 138 statements. The questionnaire included comprehensive sections on background and health-related information. By employing, among other means, factor analysis to process the data, seven personality and behavior traits were identified.

- ✓ Activity/playfulness
- ✓ Fearfulness
- ✓ Aggression towards humans
- ✓ Sociability towards humans
- ✓ Sociability towards cats
- ✓ Litterbox issues (relieving themselves in inappropriate places, precision in terms of litterbox cleanliness and substrate material)
- ✓ Excessive grooming

“While the number of traits identified in prior research varies, activity/playfulness, fearfulness and aggression are the ones from among the traits identified in our study which occur the most often in prior studies. Litterbox issues and excessive grooming are not personality traits as such, but they can indicate something about the cat's sensitivity to stress,” Mikkola adds.

## Differences in the prevalence of traits seen between breeds

In addition to individuals, clear personality differences can be found between breeds. In other words, certain personality and behavior traits are more common among certain cat breeds.

“The most fearful breed was the Russian Blue, while the Abyssinian was the least fearful. The Bengal was the most active breed, while the Persian and Exotic were the most passive. The breeds exhibiting the most excessive grooming were the Siamese and Balinese, while the Turkish Van breed scored considerably higher in aggression towards humans and lower in sociability towards cats. We had already observed the same phenomenon in a prior study,” says Professor **Hannes Lohi** from the University of Helsinki and the Folkhälsan Research Center.

The researchers wish to emphasize that no pairwise comparisons between breeds were carried out at this juncture.

“We wanted to obtain a rough idea of whether there are differences in personality traits between breeds. In further studies, we will utilize more complex models to examine factors that affect traits and problematic behavior. In these models, we will take into consideration, in addition to its breed, the cat's age, gender, health and a wide range of environmental factors,” Mikkola says.

## Assessing reliability and validity

Feline behavior and personality can be studied, for example, through questionnaires aimed at cat owners. Such questionnaires can measure



feline behavior in the long-term and in everyday circumstances, which is impossible in behavioral tests. Furthermore, cats do not necessarily behave in test settings in a way typical of themselves. Due to their subjective nature, the reliability of the questionnaires must be assessed before the data can be exploited further.

“Internationally speaking, our study is the most extensive and significant survey so far, and it provides excellent opportunities for further research. The reliability of prior feline behavioral questionnaires has not been measured in such a versatile manner, nor are they as comprehensive as this one. Establishing reliability is key to making further analyses worthwhile and enabling the reliable identification of various risk factors,” says Lohi.

The researchers reached out to cat owners who responded to the questionnaire one to three months ago, requesting them to fill out the questionnaire again or ask another adult living in the same household to respond to the questionnaire regarding the same cat. The goal was to assess the questionnaire’s reliability both temporally and between respondents. Based on two additional datasets accumulated through this method, it was possible to evaluate the reliability of the questionnaire temporally and between respondents.

“By comparing the responses, we noted that the responses provided for the same cat were very similar, while the personality and behavior traits were found to be reproducible and reliable. We also examined the validity of the questionnaire or whether it measures what it intended to measure. In these terms, too, the questionnaire functioned well,” says Mikkola.



# Protein derived from tick saliva proves effective in the treatment of equine skin cancer

A protein derived from the saliva of the tick *Amblyomma sculptum* has been successfully used by researchers at the Butantan Institute in São Paulo, Brazil, to treat skin cancer (melanoma) in horses. The results of the study are [described](#) in the journal *Scientific Reports*.

The principal investigator for the project is [Ana Marisa Chudzinski-Tavassi](#), who leads the Center of Excellence in New Target Discovery ([CENTD](#)), an Engineering Research Center ([ERC](#)) established at the Butantan Institute by São Paulo Research Foundation (FAPESP) and GlaxoSmithKline.

CENTD's mission is to discover and validate molecular targets to treat inflammatory diseases for the purpose of developing new drugs.

The protein is Amblyomin-X, which has been studied at the Butantan Institute for more than ten years and evidences significant antitumor potential in the laboratory and in vivo. It has already been approved in preclinical toxicity testing.

The researchers used “omics” tools (genomics, transcriptomics, proteomics, and metabolomics) to analyze the signaling pathways and proteins affected by the treatment of horse melanoma with Amblyomin-X.

[Roger Chammás](#), a researcher at the São Paulo State Cancer Institute (ICESP), collaborated with CENTD scientists on the project.

## IMMUNE MECHANISMS

Equine melanomas are spontaneous tumors. Unlike cutaneous melanomas in humans, they are encapsulated and locally confined in horses, rarely giving rise to metastasis. However, in both humans and horses these tumors are potentially immunogenic, i.e., capable of producing an immune response, and can serve as a model for the investigation of the immune mechanisms involved in tumor regression induced by therapeutic molecules.

In the first phase of the study, spontaneous tumors in five horses were treated for 30 days with intratumoral injections of Amblyomin-X. The treatment took place at the Butantan Institute's farm in Araçariquama, state of São Paulo. The animals were monitored throughout the period by means of clinical examinations, blood work, and biochemical laboratory tests.

The results were promising. Control tumors (not treated with the compound) maintained their shape and grew in size, whereas tumors treated with Amblyomin-X



shrank and, in some cases, even reached remission up to two months after the treatment ended.

None of the five treated animals developed any

adverse reactions. At the end of the treatment, the tumors were surgically removed for histopathological analysis. The researchers found no trace of tumoral characteristics.

The second phase of the study consisted of experiments in transcriptomics (analyzing messenger RNA expression) and interactomics (analyzing the interaction between tumor cell proteins and Amblyomin-X) to see how signaling pathways were modulated by the treatment and, especially, to obtain molecular confirmation of previous findings from in vitro and in vivo experiments conducted by Chudzinski-Tavassi and her team. The results published by the group between 2010 and 2017 suggested that the antitumor action of Amblyomin-X occurred via the modulation of the endoplasmic reticulum

and mitochondrial stress and apoptotic and proteasomic pathways, among others.

The transcriptome study was expected to confirm activation of these pathways and show whether others were affected by the treatment. The researchers also deployed next-generation sequencing and analysis based on bioinformatics and systems biology to map the initial mechanisms of the response triggered by Amblyomin-X, which culminated in tumor regression.

Among the findings of the transcriptomic analysis

was the discovery that the innate immune system's rapid response (six hours after the injections) involved the modulation of four different pathways: TLR (toll-like receptor), RIG-I (viral invasion sensors), OAS (2',5'- oligoadenylate synthetase and RNase L) and oncostatin-M (corresponding to the interleukin-6 family inflammation pathway). These findings described the first steps in the activation of a defense response that culminated in tumor regression, pointing to potential candidate targets for adjuvant therapies against tumors.



Study shows

# Vaccine Protects Dogs Against Valley Fever

A possible canine vaccine for Valley fever took a giant step closer to becoming a reality thanks to a [University of Arizona College of Medicine – Tucson](#)-led study that showed the vaccine provided a high level of protection against *Coccidioides posadasii*, a fungus that causes Valley fever. The development of a potential canine vaccine serves as a positive harbinger of a human vaccine.

Valley fever, also known as coccidioidomycosis, is primarily a disease of the lungs caused by the inhalation of airborne particles of the fungus *Coccidioides*, which is found in the southwestern U.S. and northwestern Mexico. Dogs are very susceptible to Valley fever and it is estimated that Valley fever costs Arizona dog owners at least \$60 million per year.

“The idea of a vaccine to prevent Valley fever has been the holy grail since the 1950s,” said John Galgiani, MD, director of the [UArizona Valley Fever Center for Excellence](#) and a professor of medicine. “We created a vaccine that worked. The



“The Valley Fever Center for Excellence has been working to create an effective vaccine for the prevention of Valley fever in dogs for decades. This study is a large step forward toward meeting the licensing requirements for a vaccine for dogs.”

dogs had all sorts of laboratory evidence of active, very widespread disease, and the vaccine prevented it.”

U.S. Department of Agriculture regulations require that new veterinary vaccines must be documented as safe and effective in the target species. This is the first study to examine a potential Valley fever vaccine in dogs and the results were encouraging.

The study found that Valley fever was prevented or greatly reduced in dogs that received an initial vaccine followed by a booster 28 days later. Any disease symptoms that were seen were so mild as to be clinically irrelevant.

Researchers also found that a single vaccination without a second shot did not convey protection against Valley fever, which demonstrated the need for a booster. In all dogs, the vaccine was well-tolerated.

The paper, “*Δcps1* Vaccine Protects Dogs Against Experimentally Induced

*Coccidioidomycosis*,” was published in the journal, *Vaccine*. First author Lisa Shubitz, DVM, is a research scientist at the Valley Fever Center for Excellence, where she collaborates with Dr. Galgiani and co-author Marc Orbach, PhD, a plant pathologist in the UArizona College of Agriculture and Life Sciences whose genetic research led to the development of delta *cps-1*. The unique strain of *Coccidioides* appears not to cause disease and was used to develop the live vaccine used in this study.

The Valley Fever Center for Excellence has been working to create an effective vaccine for the prevention of Valley fever in dogs for decades. This study is a large step forward toward meeting the licensing requirements for a vaccine for dogs.

Scientists at Anivive Lifesciences in Long Beach, California, who collaborated on the study along with Colorado State University and the University of Queensland in

Australia, are poised to take the next step.

“The protection provided by this vaccine in dogs is significant as it provides compelling promise as the first systemic fungal vaccine in dogs, who are significantly more susceptible to *coccidioidomycosis* than man,” said Edward Robb, DVM, MS, DACVIM, chief strategy officer for Anivive Lifesciences and a co-author on the paper.

As scientists move a canine vaccine closer to market, they will also build on this research to assess potential vaccine response in people. Anivive Lifesciences has started the vaccine registration process in the U.S. with the Center for Veterinary Biologics and are collaborating with Crozet BioPharma for a human vaccine.

“Equally promising is that this vaccine will encourage development of this vaccine candidate for humans, addressing its significant public health value in the endemic





“Ten percent of every 100,000 patients will develop complications that can result in long-term treatment and medical care, permanent disability, or death”

region,” Dr. Robb added. “The progression from concept to potential clinical use could not have been possible without the collaboration that defines this unique public-private partnership. This One Health approach supports the adage that dogs are indeed man’s best friend.”

Because this is the first study of its kind, it is unknown how long immunity will last. That is a question that will likely

be answered once a licensed vaccine is available through veterinarians. Still, if a canine vaccine proves successful, it paves the way for additional investment and research into a human vaccine, which is desperately needed in certain regions of the world.

While half of the people who get Valley fever remain asymptomatic, others will experience a weeks-to-months-long respiratory illness

that affects approximately 1% annually of the total population in Arizona and central California. Ten percent of every 100,000 patients will develop complications that can result in long-term treatment and medical care, permanent disability, or death. Annually, the disease has an economic impact of nearly \$1.5 billion in California and Arizona.

# Most dog breeds are

# highly inbred

## study shows



Dog breeds are often recognized for distinctive traits — the short legs of a dachshund, wrinkled face of a pug, spotted coat of a Dalmatian. Unfortunately, the genetics that give various breeds their particular attributes are often the result of inbreeding.

In a recent study published in *Canine Medicine and Genetics*, an international team of researchers led by University of California, Davis, veterinary geneticist Danika Bannasch shows that the majority of canine breeds are highly inbred, contributing to an increase in disease and health care costs throughout their lifespan.

“It’s amazing how inbreeding seems to matter to health,” Bannasch said. “While previous studies have shown that small dogs live longer than large dogs, no one had previously reported on morbidity, or the presence of disease. This study revealed that if dogs are of smaller size and not inbred, they are much healthier than larger dogs with high inbreeding.”

## Inbreeding affects health

The average inbreeding based on genetic analysis across 227 breeds was close to 25%, or the equivalent of sharing the same genetic material with a full sibling. These are levels considered well above what would be safe for either humans or wild animal populations. In humans, high levels of inbreeding (3-6%)

have been associated with increased prevalence of complex diseases as well as other conditions.

“Data from other species, combined with strong breed predispositions to complex diseases like cancer and autoimmune diseases, highlight the relevance of high inbreeding in dogs to their health,” said Bannasch, who also serves as the Maxine Adler Endowed Chair in Genetics at the UC Davis School of Veterinary Medicine.

The researchers partnered with Wisdom Health Genetics, a world leader in pet genetics, to obtain the largest sample size possible for analysis. Wisdom Health’s database is the largest dog DNA database in the world, helping researchers collect data from 49,378 dogs across 227 breeds — primarily from European sources.

## Some breeds are more inbred

So, what makes a dog breed more inbred than others? Bannasch explained that it's often a combination of a small founding population followed by strong selection for particular traits in a breed — often based on looks rather than purpose. While she has always had an interest in the population structure of some of these breeds, she became particularly interested in the Danish-Swedish farmdog several years ago. She fell in love with their compact size, disposition and intelligence, and ended up importing one from Sweden.

Bannasch discovered that Danish-Swedish farmdogs have a low level of inbreeding based on their history of a relatively large founding population of 200, and being bred for function, rather than a strong artificial selection for looks. And according to the insurance health data on breeds collected from Agria Insurance Sweden and hosted online by the International Partnership for Dogs, the farmdog is one of the healthiest breeds.

The study also revealed a significant difference in morbidity between brachycephalic (short skull and snout) and non-brachycephalic breeds. While that finding wasn't unexpected, the researchers removed brachycephalic breeds from the final analysis on effects of inbreeding on health.



## Preserving genetic diversity

In the end, Bannasch said she isn't sure there is a way out of inbred breeds. People have recognized that creating matches based solely on pedigrees is misleading. The inbreeding calculators don't go back far enough in a dog's genetic line, and that method doesn't improve overall high levels of population inbreeding.

There are other measures that can be taken to preserve the genetic diversity and health of a breed, she said. They include careful management of breeding populations to avoid additional loss of existing genetic diversity, through breeder education and monitoring of inbreeding levels enabled by direct genotyping technologies.

Outcrosses are being proposed or have already been carried out for some breeds and conditions as a measure to increase genetic diversity, but care must be taken to consider if these will effectively increase overall breed diversity and therefore reduce inbreeding, Bannasch said. In particular, in the few breeds with low inbreeding levels, every effort should be made to maintain the genetic diversity that is present.



## *Survey says* veterinary healthcare team members rate their **Oncology Knowledge Low**

Veterinary professionals globally rate their knowledge of oncology at just five out ten, according to survey from the newly formed World Small Animal Veterinary Association (WSAVA) Oncology Working Group (WOW). The average score varied by language, with Chinese-speaking

respondents rating their knowledge at the highest level (6.6) and Ukrainian-speaking respondents the lowest at 4.2. In contrast, respondents ranked the actual importance of oncology cases for their practice at seven out of ten, with minimal variation (6.3-7.7) between languages.

Almost 2,000 veterinary professionals from around the world, 95% of them veterinarians, completed the survey in ten languages, during September and October 2021. The results will help the WOW Group prioritize its efforts to educate and support WSAVA members globally in raising standards of care for veterinary oncology patients.

RELATED: Looking for veterinary oncology continuing education? Check out: [\*\*Vet Candy Oncology CE playlist\*\*](#)

Respondents were also asked to rank the most common tumor types seen in their practice. The most common answer was mammary tumor (81%); followed by skin tumor 75%; abdominal tumor 40%, malignant lymphoma 39%, and other tumors 5%\*. As limited numbers of North American, African, and Oceanic veterinary professionals

participated in the survey, this result may not fully reflect regional differences. For instance, in parts of the world, mammary tumor incidence is lower because of a culture of early neutering.

Surgery was the most common therapy used in private practice at 55%; followed by surgery and adjuvant therapy in 30% of cases; chemotherapy in 7% and palliative care in 4%. Immediate euthanasia was recommended in 1% of cases.

While chemotherapy is only currently used by 7% of respondents, when asked which educational resources would be most valuable to them, chemotherapy protocols were requested by 82%. In addition, 53% asked for information on tumor staging, support with cytology was requested by 51%, information on treatment side-effects by 38%; advice on surgical margins by 36%, on radiation

therapy by 24% and on palliative care by 6%.

“Cancer is increasingly common in companion animals, with almost 50% of dogs over 10 years of age developing this devastating disease. To support WSAVA members effectively in treating oncology patients, we wanted to know where they needed help most urgently,” explained Dr Jolle Kirpensteijn, former WSAVA President and Member of the WOW Group. “Our survey is the largest the WSAVA has ever conducted and shows the reach of this well-respected association, which works to share best practice in companion animal veterinary care around the world.”

He added: “It is salutary to see the huge demand for veterinary oncology education all over the world. We have much to do but are excited at the opportunity to support WSAVA members and to offer new hope to oncology patients and their owners globally.”



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