

# WEST COAST VETERINARIAN

MARCH 2018 | Nº 30

## TAKING WING WORKING RAPTORS AT THE AIRPORT



THE LIFE OF AN ANESTHESIA NERD  
.....

TRAUMATIC WOUND MANAGEMENT  
.....

REGENERATIVE MEDICINE OVERVIEW  
.....

SUPPORTING THE MARGINALIZED IN  
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COREY VAN'T HAAFF  
EDITOR

» TO THE EDITOR

Letters from members are welcome. They may be edited for length and clarity. Email us at [wcveditor@gmail.com](mailto:wcveditor@gmail.com).

» ON THE COVER

Airport bird control. Photo courtesy of Ken Langelier

**T**wo things make me uneasy: flying and large birds. So I avoid both. Sure, I feed a plethora of winged creatures (Steller's Jays, Ring-necked Doves, Anna's Hummingbirds, finches, and both Pileated Woodpeckers and Northern Flickers) from our back deck. I've even mustered enough courage to gently wrap a towel around a few errant birds who find themselves flying again and again against our glass railings to assist them with 'up and over.'

But learning about how people train and then work with raptors on a daily basis to keep travellers and communities safe was eye opening. I'm in awe of the skill and courage these people show as they go about their work. Veterinarians, too, daily deal with these birds who, I imagine, are more difficult to assess and treat than, say, my tiny new Chihuahua, Ella, a recently arrived rescue found wandering the streets of California.



So, I was very pleasantly surprised, as I awaited her first check-up at her veterinary clinic, to see two of the parrots rescued from Greyhaven Exotic Bird Sanctuary (see our story in the June 2017 issue of *West Coast Veterinarian*). I was able to get quite close, though I lacked the requisite courage to touch them. I was delighted to learn how well they were settling in at their new owner's home, how much affection she has for them, and that each one has a distinct personality.

As you read the articles in these pages, please pay particular attention to those companies who advertise with us (as well as those who sponsor tables and CE sessions throughout the province). The advertisers in the pages of *West Coast Veterinarian* provide much needed revenue that allows us to pursue the stories you are reading today. Please support (and thank) those companies

you see in our pages; and if a particular company you like is missing, maybe encourage them to support the Chapter through quarterly advertising. Or send me a contact name and number, and let us handle it here at the office.

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**DR. AL LONGAIR WITH OLIVE AND THE HONOURABLE JUDITH GUICHON**

CVMA-SBCV Chapter Vice President Dr. Al Longair visits Government House in Victoria to meet Olive, the unofficial first dog of BC, and her owner the Lieutenant Governor of British Columbia, Her Honour, the Honourable Judith Guichon, OBC.



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**CHRIS JORDAN, BSc (Hons), BVetMed, Dipl. ECVS, MRCVS**, graduated from The Royal Veterinary College (RVC) in London, England, in 2008. Following graduation, he spent two years in a primary care small animal practice before returning to RVC where he undertook a rotating internship in the internationally renowned Queen Mother Hospital for Animals. In 2012, he completed his surgical training as a European College of Veterinary Surgeons (ECVS) Resident in small animal surgery, ultimately leading to him becoming an ECVS Diplomate. He works at Tri Lake Animal Hospital & Referral Centre in Lake Country.



**DAVID LANE, DVM, Dipl. ACVSMR (CANINE)**, has been practising veterinary medicine in BC since his graduation from OVC in 1992, transitioning from mixed practice to exclusively small animals, and then to specializing in canine sports medicine. He operates Points East West Veterinary Services, a mobile sports medicine practice operating in both Squamish and Whistler. When not palpating painful dogs, he can be found skiing, kayaking, mountain biking, or recovering afterwards in the hot tub.



**KEN LANGELIER, OBC, DVM**, graduated in 1981 from WCV, where he received the award for Outstanding Achievement in Medicine. He is the past recipient of the CVMA's Humane Award, the British Columbia Federation of Naturalists' Recognition Award, the BCSPCA's Veterinarian of the Year award, and the BC Veterinary Medical Association's Veterinarian of the Year. In 2008, he received the Order of British Columbia in recognition of his work with wildlife. He works at VCA Canada Island Animal Hospital in Nanaimo.



**TONI LAOUTARIS, RVT, VTS (ANESTHESIA/ANALGESIA)**, graduated from Georgian College in Ontario in 2006 and began working in an emergency/

referral hospital setting, within emergency/critical care and surgery services. She obtained her specialty with the Academy of Veterinary Technicians in Anesthesia and Analgesia (AVTAA) in 2014. Toni moved to BC in 2016, and is lead technician and anesthesia technologist at the Vancouver Animal Emergency and Referral Centre.



**SHAWN LLEWELLYN, DVM**, graduated from AVC in 2008. He is a partner and veterinarian at Scottsdale Veterinary Hospital in Surrey, and is the Board President and Veterinary Outreach Coordinator for Paws for Hope Animal Foundation. He is the past recipient of the Christofor Award in Animal Welfare and the CVMA's Humane Award.



**CLARE TOMPKINS, BSc, DVM**, graduated from OVC 1994, started as a large animal practitioner in rural Ontario, and moved to BC in 2001. A partner in a large mixed animal practice on Vancouver Island for 15 years, she has enjoyed working as a locum for the last 18 months. Outside of work, she tries to avoid falling off her green Thoroughbred whom she is turning into an Eventer.



**MARINA VON KEYSERLINGK, PhD**, grew up on a cattle ranch in British Columbia. She joined UBC's Animal Welfare Program in 2002, and was appointed as a NSERC Industrial Research Chair in 2008. She is recognized internationally for her research on the care and housing of dairy cows and calves.



**DANIEL WEARY, D Phil**, is a Professor and NSERC Industrial Research Chair at UBC. He studied biology at McGill and Oxford, and went on to co-found UBC's Animal Welfare Program where he still works and co-directs this active research group. He was recently awarded UBC's Killam Research Prize.

# WCV

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## SPECIAL TEAR-OUT POSTER FOR MEMBERS ONLY RECOGNIZING PAIN IN YOUR ANIMALS



I love that veterinary medicine allows for continual learning opportunities. For me, this is the sticking power in my ability to be stimulated in my profession and stay in it. After years of working emergency medicine, I have recently changed over to the general practice side of things. Imagine my dismay at having to do the dreaded dentistry, after years of never wanting to touch a tooth with a ten-foot pole. I never thought I would enjoy this as much as I have. I have also signed on to a contract at a cats-only practice—something else I don't think I would have previously fully appreciated. I have learned so much about our feline patients in such a short period of time, in particular that they really like to do things their own way. I wonder what else lies ahead of me in this endlessly rewarding profession.

Continual learning also happens for me in my role with the CVMA-SBCV Chapter. I have had great mentorship through our Board of Directors, many of whom have "been there and done that" before my time in veterinary practice. I can always look to them when I need advice on a particular Chapter topic or issue. Our Executive Director has a world of experience at her fingertips, so all of us on the Board of Directors learn from her as well. And on it goes.

Another way for me to continuously learn is through my duties as President of the Board. One of my favourite responsibilities is my attendance at the AGMs of other western provincial associations. There, I network and learn what the other veterinary medical associations are doing for their members. Topics and issues that they face are often very similar to our issues. Their solutions to problems are shared with our Board of Directors and in turn make us a better Chapter. I am going to Winnipeg in a few weeks to enjoy some cold weather and some wonderful veterinary company. Stay tuned.

In January, Al Longair, the CVMA-SBCV Chapter Vice President, went to Victoria to meet with the Lieutenant Governor of British Columbia, Her Honour, the Honourable Judith Guichon, OBC. Dr. Longair spoke with the

Lieutenant Governor about the recent *West Coast Veterinarian* story on Olive, the unofficial First Dog of BC, and the contribution of veterinarians to communities throughout the province. It is vital for the Chapter to continue to highlight the important role that veterinarians hold in protecting animal and human health.

The CVMA Annual Conference will be held in Vancouver, July 5–6, in the new JW Marriott Parq Vancouver hotel, next to BC Place. The Conference will offer many lectures, several wet labs, a trade show room, and plenty of social events. This event will welcome veterinarians from across Canada, so it will be a neat opportunity to learn and mingle at the same time.

The Chapter will also be hosting our 2018 Annual Conference in November. We have booked Dr. Marty Becker as our keynote speaker, which will undoubtedly be informative. Our Continuing Education Committee works hard year-round to secure speakers on topics of interest and relevance. If you have any recommendations for future speakers or topics, please let us know.

I hope you all received the Chapter's Report on the recent CVBC General Meeting. The Chapter believes in transparency between the College and BC veterinarians. We also believe that, as an association, we can help bridge some of the communications between the College and our members. We wish to be a sounding board for our members and ask questions to the College for clarification on your behalf.

As always, please let us know if there is anything your Chapter can do for you, or give us suggestions for what we can improve on. [WCV](#)

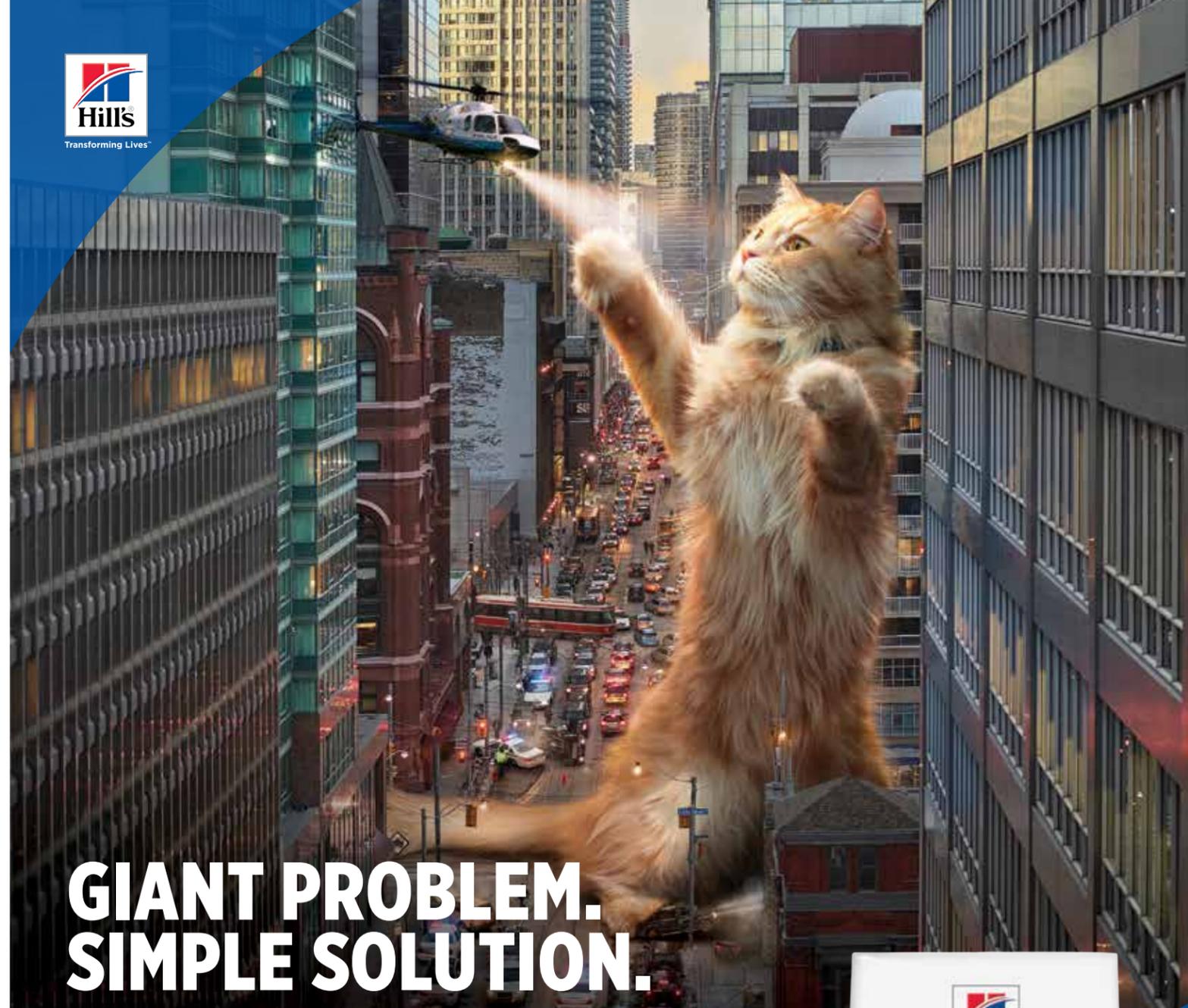


Sarah Armstrong, DVM, graduated from OVC in 2007. Following graduation, she worked full time in general practice and worked part time at a local emergency practice in Southern Ontario before moving to Vancouver, BC, where she currently works as a locum veterinarian.



**ENDERBY VETERINARIAN DR. SUSI CIENCIALA WINS INAUGURAL DR. CAROL MORGAN MEMORIAL AWARD**

The winner of the inaugural Dr. Carol Morgan Memorial Award is Dr. Susi Cienciala. The award supports continuing education for veterinarians in Canada and is named in honour of former BCSPCA board member Dr. Morgan, a tireless advocate for animal welfare and ethical veterinary practice, who passed in 2015. Dr. Cienciala is an equine veterinarian at Deep Creek Veterinary Services in Enderby. Her goal is to bring the science of how horses learn to veterinary students in Canada, to both improve the welfare of their patients and to keep them safer as equine veterinary practitioners.

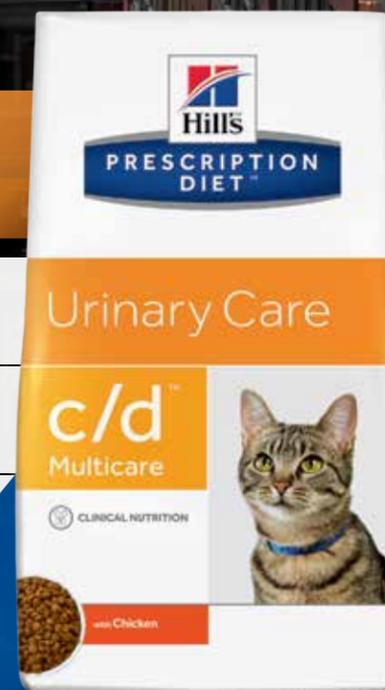


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<sup>1</sup>Kruger JM, Lulich JP, MacLeay J, et al. Comparison of foods with differing nutritional profiles for long-term management of acute nonobstructive idiopathic cystitis in cats. *J Am Vet Med Assoc*. 2015;247(5):508-517.  
<sup>2</sup>Lulich JP, Kruger JM, MacLeay J, et al. Efficacy of two commercially available, low-magnesium, urine acidifying dry foods for the dissolution of struvite uroliths in cats. *J Am Vet Med Assoc*. 2013;243(8):1147-1153. Average 27 days *in vivo* study in urolith forming cats.  
<sup>3</sup>Urine calcium directly measured and risk of calcium oxalate crystal formation measured by Hill's COT test v. US ROYAL CANIN VETERINARY DIET<sup>™</sup> Urinary SO<sup>®</sup> cat dry formula. ©2018 Hill's Pet Nutrition Canada, Inc. ©/™ Hill's, Prescription Diet and c/d Multicare are trademarks owned by Hill's Pet Nutrition, Inc. Royal Canin Veterinary Diet is a registered trademark owned by ROYAL CANIN SAS 2016.

**T**he CVMA is part of the Coalition for Small Business Tax Fairness, which opposes the federal government's tax proposals that would dramatically change the way incorporated small businesses are taxed in Canada. Veterinarians with businesses should work closely with accounting professionals to understand implications to your individual situation. Read the latest information at [www.smallbiztaxfairness.ca](http://www.smallbiztaxfairness.ca).

Effective December 1, 2018, a veterinary prescription will be needed to use medically important antibiotics (MIAs) in animals. Health Canada is moving a number of MIAs approved for veterinary use before 2004 to the Prescription Drug List. Health Canada will establish the same level of oversight for those MIAs approved before 2004 as for those approved after. Visit the Responsible Use of Medically Important Antimicrobials in Animals section of the Government of Canada website for more information. In addition, as of November 13, 2017, these antimicrobials can no longer be imported for own use. MIAs are available with a veterinary prescription, from a veterinarian or pharmacist, or as a mixed medicated feed from a feed mill. The CVMA is engaged with the Veterinary Drugs Directorate through a sub-committee of the Canadian Animal Health Products Regulatory Advisory Committee. Visit [www.canadianveterinarians.net/policy-advocacy/veterinary-oversight-of-antimicrobial-use-in-canada](http://www.canadianveterinarians.net/policy-advocacy/veterinary-oversight-of-antimicrobial-use-in-canada) for more information.

The Emerging Leaders Program (ELP) offers an opportunity to explore approaches to personal and professional accomplishments and working relationships. The 2018 ELP takes place on July 5 and 6, during the annual convention in Vancouver. CVMA members who graduated within the last ten years (2007 or later) can apply for full sponsorship to participate (up to two

sponsored participants per province will be selected). Visit the Emerging Leaders Program page under the Science & Knowledge section of our website for more information. Applications are due March 23, 2018.

The CVMA has moved its membership management system to a new platform. Access the new CVMA membership portal by visiting [www.canadianveterinarians.net](http://www.canadianveterinarians.net) and clicking the Login link at the top of the home page. Please note that your CVMA login credentials have changed to email and password; you should have received an email with your personal login information. Log in to review and update your profile and reset your password. Please notify the CVMA if you experience any technical difficulties. **WCV**



*Troye McPherson, DVM, was born in Cape Breton, NS, and graduated from the Ontario Agricultural College in 1984 and the Ontario Veterinary College in 1989. She headed to western Canada where she worked in large animal and small animal veterinary medicine, taught agricultural courses at Lakeland College in Vermilion, AB, and became the Acting Director of the Animal Health*

*Technologist Program at the College for two semesters. She returned to Nova Scotia to continue expanding her knowledge in the profession: in mixed practice, small animal, and emergency medicine; and, as a Federal Veterinarian, meat inspector for a year. She also helped develop a Veterinary Assistant Program at a private business college in Halifax. However, her true calling is as a small animal practitioner. Dr. McPherson is a member of the American Association of Feline Practitioners, is currently the CVMA representative for the Federation of Veterinarians of Europe, and has served on the Council of the Nova Scotia Veterinary Medical Association twice. She lives in Dartmouth with her husband, Patrick, five Border Collies, and four cats.*

## DR. JOHN BROCKLEBANK RETIRES FROM CVBC

Dr. John Brocklebank resigned as Deputy Registrar of the College of Veterinarians of BC effective December 31st, 2017. John has been with the College since September 2004, and he has decided it is time to pursue new and resurrected interests. He expressed to Council and to the Registrar his gratitude for the privilege of having served the College and extended similar gratitude to all registrants; the public; and current (and former) staff, inspectors, and committee members who have assisted him over the years.

The wealth of his experience and institutional knowledge will be greatly missed. The CVBC thanks him for his years of dedicated service, as does the CVMA-SBCV Chapter, and we wish him all the best in the future.

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# DO YOU RECOGNIZE THESE SIGNS OF PAIN IN YOUR ANIMALS?

Dogs, cats, and other pets or farm animals can't tell us when they hurt. It's important to recognize these signs of pain, and then call or visit your veterinarian for advice. Look for the following signs of pain in your animals:

## HORSES & SMALL RUMINANTS

**Behaviour** Changes ranging from lethargy and withdrawal, to aggression and lashing out. **Mobility** Unwilling or unable to move or get up, if already lying down; pacing, especially if the animal is standing and experiencing difficulty in lying down.

**Respiratory Pattern** Panting; increased respiratory movement; increased effort and rates. **Lameness** Non-weight bearing—may be indicator of acute pain (e.g., trauma) or chronic (e.g., inflammatory, neoplastic, etc.).

**Bruxism** Grinding of teeth **Colic** Pain can manifest in these additional signs: looking at or kicking at the abdomen; lying down (sometimes throwing themselves down) and rolling; reduced manure output and loss of gut sounds; change in facial expression away from a relaxed state; excessive sweating; increased heart rate (45 bpm or higher).

**Loss of Appetite**



## BIRDS, REPTILES, & POCKET PETS

### BIRDS

**Behaviour** fluffed feathers, retreating to bottom of the bird cage.

### RABBITS

**Behaviour** hiding. **Loss of Appetite** decreased appetite. **Bruxism** grinding of teeth. **Facial Expression** closing of eyes, cheeks flattened or sunken, whiskers still and pushed away from the face, ears tightly folded and held closer towards the back, squinting of eyes.

### REPTILES

**Behaviour** hiding, avoidance, abdominal splinting (tucking), aggression and protection of painful sites, lethargy or anxiety. **Mobility** difficulty in moving or reduced movement. **Loss of Appetite** decreased appetite, failure to eat.

**Lameness**



### RODENTS

**Behaviour** hunched posture, hair standing up or looking rough, stretching to the side or arched back, lack of normal behaviour such as digging or exploring. **Loss of Appetite** failure to eat, weight loss, squinting of eyes.

### FISH

**Behaviour** colour change, increased movements of the bony flap covering the gills of bony fish, withdrawal and isolation among schooling fish, inability to maintain orientation in the water column, decreased evasive capacity. **Loss of Appetite** decreased appetite.

### GUINEA PIGS

**Loss of Appetite** decreased appetite. **Bruxism** grinding of teeth.



## DOGS

**Behaviour** Changes ranging from lethargy and withdrawal, to aggression and lashing out. **Vocalization** Intermittent or ongoing whining or yowling. **Mobility** Unwilling or unable to move, particularly if the animal is already sitting or lying down; pacing, especially if the animal is standing and it seems difficult for them to lie down.

**Lameness** (usually due to pain) or non-weight bearing—may be indicator of acute pain (e.g., trauma) or chronic (e.g., inflammatory, cancer, etc.).

**Respiratory Pattern** Panting; increased respiratory movement.

**Loss of Appetite**



## CATS

**Behaviour** Changes ranging from lethargy and withdrawal to aggression and lashing out; evasion and hiding. **Vocalization** The perception of some owners that cats cry is incorrect; cats are more likely to endure pain in silence, with the exception of growling at touch to painful area and intermittent or ongoing whining or yowling.

**Mobility** Unwilling or unable to move, particularly if the animal is already sitting or lying down; pacing, especially if the animal is standing, and it seems difficult for them to lie down. **Lameness** (usually due to pain) or non-weight bearing—may be indicator of acute pain (e.g., trauma) or chronic (e.g., inflammatory, neoplastic, etc.).

**Respiratory Pattern** Panting; increased respiratory movement; increased effort and rates. **Facial Expression** (particularly important in cats) Eyes are no longer round, may be slanty, slitty, or frowning; ears held slightly downward; in extreme internal pain, the third eyelids may be visible. Cats are very subtle, and owners can look at old photos for comparison. **Posture** Hunched “breadbox” position. A non-painful cat sleeps relaxed, stretched out, or curled up in a donut. **Loss of Appetite**

# THE YEAR AT A GLANCE



FEBRUARY  
NATIONAL PET DENTAL HEALTH MONTH  
WORLD SPAY DAY



MARCH  
NATIONAL TICK AWARENESS MONTH



APRIL  
PET FIRST AID AWARENESS MONTH  
NATIONAL PET ID WEEK  
BC ANIMAL ABUSE PREVENTION DAY

NATIONAL HAIRBALL AWARENESS DAY  
WORLD VETERINARY DAY



MAY  
RESPONSIBLE PET OWNERSHIP MONTH  
NATIONAL SERVICE DOG EYE EXAMINATION MONTH  
PET CANCER AWARENESS MONTH



JUNE  
WORLD PET MEMORIAL DAY  
TAKE YOUR CAT TO WORK DAY  
TAKE YOUR DOG TO WORK DAY



AUGUST  
INTERNATIONAL ASSISTANCE DOG WEEK  
INTERNATIONAL CAT DAY

INTERNATIONAL HOMELESS ANIMALS DAY  
INTERNATIONAL DOG DAY



SEPTEMBER  
ANIMAL PAIN AWARENESS MONTH  
WORLD SUICIDE PREVENTION DAY

WORLD RABIES DAY  
RESPONSIBLE DOG OWNERSHIP MONTH



OCTOBER  
ANIMAL HEALTH WEEK  
WORLD ANIMAL DAY  
NATIONAL VETERINARY TECHNICIAN WEEK



NOVEMBER  
WORLD ANTIBIOTIC AWARENESS WEEK



PHOTO BY FRANCKREPORTER/ISTOCK.COM

# JOIN THE CLUB

BY CHLOE GUSTAVSON

One of the greatest pieces of advice I have ever received is to always have something to look forward to. Here at veterinary school, that advice is particularly useful. Our days are filled with long hours of lectures to accommodate the breadth of our curriculum. While academic subjects remain our focus, it is often extra-curricular involvement that offers us unique opportunities to learn outside the classroom. Inevitably, we jump at the chance to apply the theory we have learned in the lecture hall. These valuable experiences, which give us a glimpse into the world we are working toward, are the product of our WCVM student clubs.

Club Days happen at the beginning of the school year. Over two days, our common lunch area is plastered with posters, while club presidents encourage their peers to sign up. Teams of third- and second-year students typically take on leadership roles, from presidents and secretaries to fundraisers and treasurers. Promoting early involvement helps the clubs to continue by selecting first-year representatives who will hopefully take the leaders' seats in subsequent years. Clubs hold annual general meetings to discuss their goals and ideas, which include arranging lunchtime talks and organizing wet labs for their members. Throughout the year, these experiences become some of our favourite parts of veterinary school.

It is common for upper-year students to advise the incoming class to join every club. In doing so, first-year students are able to take part in a diverse array of activities, both in the area of veterinary medicine they are currently most interested in, and those they may never have considered. Students motivated to find their future specialty might join the Radiology Club for case presentations and lunch-hour demonstrations, or the Emergency and Critical Care Club for its CPR labs. Others may seek out the Pathology Club to shadow necropsies as part of 'pathologist for a day.' We all come to veterinary school with our own strengths and passions, but perhaps more importantly, we come with an open mind. It is particularly motivating to see prospective small animal vets signing up for the Equine Club farrier labs, or production

**"STUDENTS MOTIVATED TO FIND THEIR FUTURE SPECIALTY MIGHT JOIN THE RADIOLOGY CLUB FOR CASE PRESENTATIONS AND LUNCH-HOUR DEMONSTRATIONS, OR THE EMERGENCY AND CRITICAL CARE CLUB FOR ITS CPR LABS."**

medicine hopefuls joining the Laboratory Animal Medicine Club's handling workshops.

An important feature to recognize about the WCVM club offerings is the amount of hard work that students put into planning, and the generosity our teachers and faculty demonstrate by participating. I am a member of the Small Animal Club, and taking part in cageside rounds is one of my favourite experiences so far. Groups of students are invited to discuss current cases with specialists in our own Veterinary Medical Centre. Each time I finish lessons in mapping treatment in radiation oncology, problem-solving with the principles of neuro exams in action, and assessing hospitalized ICU patients with pain evaluation scales, I leave inspired and grateful for the clinicians' dedication to helping us learn.

Aside from academically enriching experiences, several WCVM clubs provide the opportunity for students to take a study break. In a program as demanding as ours, we are frequently reminded that attention must be paid to striving for a healthy work-life balance. Clubs like the Wildlife Disease Association organize outdoor hikes and camping trips in addition to their panel discussions with experts in the wildlife field. The Production Animal Club holds lunchtime barbecues in between taking students out dehorning on the farm. For students missing their pets back home, club participation can provide the comfort of spending time with animals. The Equine Club hosts a 'mare care' program where teams of students volunteer to groom our teaching horses on a weekly basis. Animal Welfare and Behaviour Club members can take our teaching dogs out for walks.

Clubs encourage classmates from a variety of backgrounds and comfort levels to join as a way to improve confidence and skill in dealing with a variety of veterinary species. The Wildlife and Exotic Animal Medicine Society (WEAMS) offers exotics handling labs, and student members are invited to closely shadow the treatment of wildlife patients in hospital. A subset of WEAMS members work with Jadis, our rescued Red-tailed Hawk, helping with her care and participation in wildlife education events around Saskatoon. One of my classmates memorably mentioned to me that whenever this fast-paced program seems especially overwhelming, spending time in the wildlife ward is a consistent source of reassurance and belonging.

These positive experiences exemplify how important it is for us to keep our eyes focused forward. Veterinary school will be what we make of it, and our clubs prompt us to make a committed effort to keeping our learning fun. This is a lesson that I hope we carry with us beyond our school days and into our careers in the not too distant future. So, I ask you, readers, what are you looking forward to this year? [WCV](#)



Chloe Gustavson obtained a BSc from the University of Victoria prior to coming to WCVM. She calls Vancouver's North Shore home, where she most enjoys spending time near the ocean with her dog, Leo. Upon graduation she plans to return to BC to work in small animal practice.

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# DEVELOPING A VISION OF THE IDEAL FARM

BY MARINA VON KEYSERLINGK, PhD, AND DANIEL WEARY, D PHIL

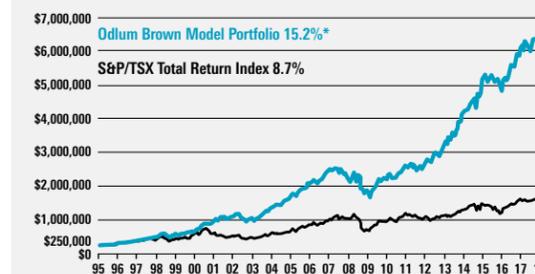


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**F**armers and others who work in agriculture sometimes seem to be under siege from critics regarding practices used in modern farming. But simply responding to criticisms provides a poor basis in planning for the future. In recent work, UBC researchers have asked participants how they would describe an ideal farm. Our hope is that the results can help farmers and others develop a vision of what their farms and industry will look like in the decades to come.

**“MANY PARTICIPANTS COMMENTED ON HOW IMPORTANT IT WAS THAT THE FARMER AND WORKERS TREATED COWS HUMANELY.”**

We have conducted two studies probing participants' views on what makes an ideal farm. The first focused on dairy farms and surveyed the views of almost 500 American citizens. We asked a single open-ended question: What do you consider to be an ideal dairy farm and why are these characteristics important to you? The text from these responses was then coded to identify major themes. Participants generally cited more than one characteristic with multiple reasons for each.

The most commented issues related to the “cow” herself, reflecting concerns about cow treatment. For example, many participants commented on how important it was that the farmer and workers treated cows humanely. For example, people commented on the value of treating the animals with “respect,” “fairly,” “kindly,” “dignity,” and “with love.”

Participants also mentioned aspects related to the business operation, suggesting that the ideal dairy farm should also be profitable, productive, and efficient. Some participants also suggested that the farm should be small, organic, operated by family farmers, and committed

to their community (e.g., offering tours or selling their products locally). Participants also said that the farmers should be educated, loving, and competent.

Some participants also commented on the importance of the quality of production, stating that the ideal dairy farm must produce high-quality milk products, and that these products be clean and safe to consume. However, they rejected the use of hormones, antibiotics, or other chemicals for the purposes of increasing production, but did state that animals should: “Not be treated with synthetic hormones or antibiotics—unless absolutely necessary.” The respondents also suggested that the cow's quality of life influences the quality of the milk she produces, which in turn influences human health.

Our second study focused on pig farms, and surveyed the views of approximately 200 American citizens. We again asked a single open-ended question: What do you consider to be an ideal pig farm and why are these characteristics important to you?

Again, participants generally cited more than one characteristic and multiple reasons. Animal welfare (e.g., space, freedom to move, and humane treatment) was the most mentioned theme: 74 per cent of the respondents referred to this theme when describing or justifying the features they considered important. Most of the respondents focused their concerns on issues such as providing sufficient space to move, proper feeding, allowing for contact with outdoors or nature, absence of pain and suffering, and no mistreatment. Participants also made references in relation to animal sentience, using positive terms such as “happiness” and “intelligence.” The reasons used to justify their views were largely based on ethics with many respondents using words such as “respect,” “decency,” “dignity,” and “humane” to refer to animal treatment.

The role of the business operation (e.g., profitability, compliance with sanitary and environmental rules and regulations, and workers rights) was the second most important characteristic of an ideal pig farm.

Some respondents viewed the implementation of modern technology as an important feature of an ideal farm. For example, one respondent stated: “Another aspect of a perfect pig farm is the use of technology and automation. This will make the farm more efficient and more likely to keep the farm profitable.” However, participants also placed great importance on naturalness (e.g., natural feeding), in part because they believed that this would benefit both the pigs and the meat they produce. As stated by one of the participants: “An ideal pig farm is a farm that has wide open space for pigs to roam and feed. This is important as I feel keeping pigs in cramped, enclosed space will help spread disease and infections. The pigs will also produce better meat as they are healthier and less stressed.” As in the case of the ideal dairy farm, participants rejected the use of hormones, antibiotics, and other chemicals for the purposes of increasing production. Thus, participants in both studies argued that the animal's quality of life influences the quality of the product produced, which in turn may affect human health.

In summary, the findings of these studies point to a suite of practices that resonate with societal values. Both studies also illustrated the importance that respondents placed on the attitudes and values of the people responsible for the animals, and on an animal's freedom to move and their ability to fulfill natural and highly motivated behaviours like grazing on pasture. The question now is how will the agricultural industries use such results to develop a vision for the future of farming, and what mechanisms can be put in place to see this vision achieved.

This report is based on Cardoso et al., 2016. *J. Dairy Sci.* 99:1663–1671 and Sato et al., 2017 *Animals* 7, 64; doi:10.3390/ani7080064. WCV

PHOTO BY TILSONBURG/STOCK.COM

# SALMON FARMING

## A FLUID SCIENCE

BY VERONICA GVENTSADZE, MA, PhD, DVM

**W**hether or not we enjoy eating salmon, this fish is an integral part of the Pacific Northwest in life and in death. It has nourished humans and animals, both on land and in the sea, and fertilized the rainforest itself. Our dogs seem to find it irresistible, especially after it has shuffled off this mortal coil and lain around for a while; but while a dog perfuming its coat with salmon remains may be aesthetically objectionable to its owner, it is not dangerous, as compared to the dog actually eating raw fish which, even when still alive, can put the animal at risk for pancreatitis and various parasites including one that causes Salmon Poisoning disease.<sup>1</sup> In the last century, this fish, itself a symbol of persistence and drive, has been a major driving force of the economy, resulting in purposeful aquaculture of Atlantic salmon right next to the life cycle of wild Pacific salmonids. The resulting picture involves the health and welfare of both wild and farmed fish, the marine ecosystem as a whole, the species that are used to feed the salmon, the health of people and animals who eat the fish and its derivative products, and the communities involved in farming and in traditional fishing.

By now, it is a purely academic exercise to ask whether salmon farming should exist at all. A practice that really took off only some two decades ago has become a highly profitable and economically influential industry that is not about to close shop for the asking and protesting. The Department of Fisheries and Oceans has assessed the total harvested value

of aquaculture products at \$534 million,<sup>2</sup> while an economic study by the BC Salmon Farmers Association found that, in 2016, the industry put \$1.5 billion toward the BC economy.<sup>3</sup> Since the 1930s, small farms raised Coho and Chinook salmon in ocean feed lots. Pacific salmon did not take well to domestication, and farmers eventually switched to Atlantic salmon production, following the examples of Norway, Scotland, and Ireland. Thus, salmon farming became a huge industry in a country that still has no shortage of wild fish. Overfishing and the resulting decline in wild salmon stock may have been a factor in the 1970s, but this is no longer the case. Together with Shakespeare, we could say, “Oh, reason not the need.” Salmon farming does not claim to solve any food shortage. While crops like wheat and rice, and meats like beef, pork, and chicken are accessible and affordable to most people, salmon is by comparison a costly and therefore highly profitable item. The drive to eat more fish fat has likely contributed to the growth of farming. Atlantic salmon grow quickly to a consistent size good for commercial purposes and are overall resistant to disease. Compared to Pacific species of salmon who are lean marathon-runners, Atlantic salmon are docile and sedentary, which allows them to store and retain a higher percentage of body fat compared to wild species.<sup>4</sup> Yet

**“SALMON FARMING DOES NOT CLAIM TO SOLVE ANY FOOD SHORTAGE.”**

not all fats are created equal, and there is debate about the proportion of anti-inflammatory omega-3 to pro-inflammatory omega-6 fatty acids in farmed and wild fish respectively. At the same time, fat is the repository of chemicals a fish receives either in feed or from its environment, a fact that raises understandable concern among laypersons and scientists alike.

Historically, Atlantic salmon were first introduced into Pacific waters for a leisurely rather than pragmatic purpose. Fertilized eggs of Atlantic salmon were put in the waters off the coast of California in 1874 to produce stock for sports angling. More eggs were introduced again and again after the repeated failure of adults to spawn and reproduce. Thus, Atlantic salmon in Pacific waters is a foreign species that has so far proven to be non-invasive. It has been known to escape sea pens but is incapable of interbreeding with Pacific species of salmon.<sup>5</sup>

One of the greatest concerns is the presence of viruses in farmed fish that may affect wild species. Piscine reovirus is a robust non-enveloped virus capable of surviving outside the host. Public attention was drawn to it during a recent release of blood from a fish farm. It is highly contagious but shows low virulence; a civilized virus that prefers to lie dormant rather than destroy its host. It is present in all farmed salmon (who are uniformly vaccinated for it), and has been associated with heart and skeletal muscle inflammation, a disease that would be fatal to wild fish who need to be athletes. Current research, much of it conducted by Dr. Kristi Miller, a scientist with the Department of Fisheries and Oceans, has not established direct or exclusive causation of clinical illness by this virus, although it may be one of the factors. A major challenge is that it is not easy to determine the cause of death of wild salmon: debilitating illness causes them to be predated or to drop to the ocean floor and become lost to follow-up, as we would say in clinical practice.

Sea lice are crustaceans that are particularly destructive to young fish, both salmonids and herring (the latter is essential to nutrition and survival of sea lions). The use of pesticides on fish farms is controversial since, like any parasite, sea lice are capable of developing resistance. At the same time, not controlling sea lice might put passing wild fish at risk of infestation, a topic brought to public attention largely through the activist efforts of Alexandra Morton.

Many have argued not against the practice of farming as such, but against keeping fish in sea pens rather than land-based reservoirs. Currently, there are only a few such farms, but their operations look promising.<sup>6</sup> If the transition from sea to land were to take place on a large scale, it would give the ocean back to native species of fish and mammals, while leaving behind any chemicals left over from farming and any organisms (viruses, sea lice) possibly modified by the presence of farmed fish. It would solve the issues of fluctuating oxygen levels and of algal and plankton blooms that affect fish in open sea pens, and of shooting mammals such as sea lions and seals who try to raid the pens (some getting trapped in the nets and drowning when the tide comes in). It would not alleviate concerns about the welfare of farmed fish. Their reasoning may be less nuanced than that of mammals, but their senses are exquisite, and their lives in captivity are longer than those of mammalian production species. (Farmed salmon live three to five years until they are harvested.) With nothing to do but eat and swim, do fish suffer from boredom and frustration? This fascinating and much-needed field of research leads to developing optimal and flexible patterns of feeding that minimize stress

and aggression and provide an outlet for the animals' inbuilt foraging behaviour.

What is the role of veterinarians in salmon farming? Many work in government-run as well as private laboratories, and in the “field” (i.e., on the water) to monitor the health of wild as well as penned fish; but we do not tend to hear much about them or from them except for an article by Dr. Sonja Saksida in the March 2011 issue of *West Coast Veterinarian*. Notably, the CVMA has no position statements on the health and welfare of farmed salmon. And yet these mute animals deserve some kind of voice. We do not all need to become experts in aquaculture and fish health and welfare, but we have to be prepared for impartial and critical evalu-

**“NOTABLY, THE CVMA HAS NO POSITION STATEMENTS ON THE HEALTH AND WELFARE OF FARMED SALMON. AND YET THESE MUTE ANIMALS DESERVE SOME KIND OF VOICE. WE DO NOT ALL NEED TO BECOME EXPERTS IN AQUACULTURE AND FISH HEALTH AND WELFARE, BUT WE HAVE TO BE PREPARED FOR IMPARTIAL AND CRITICAL EVALUATION OF EVIDENCE.”**

ation of evidence. For me, studying the issues raised by fish farming has been an exercise in not throwing out the baby—hatchling?—with the bathwater. I have reminded myself that data and observations should not be dismissed simply because they were gathered by a passionate naturalist without a formal degree in biology, as is the case with Alexandra Morton's research.<sup>7</sup> Neither should such data be dismissed simply because the conclusions drawn from them may be flawed and biased. Concerns advanced by worried laypersons should not be brushed off as paranoia or conspiracy theories and deserve attention on their own merit. Conversely, science cannot be accepted on the authority and reputation of its source. Rather than waiting to see what Norwegian, American, and other leading scientists have found and recommended, Canadian scientists should assume leadership in research that is both specific to this part of the world and of benefit to communities similarly blessed and challenged with the gift of salmon. **WCV**



VERONICA GVENTSADZE, MA, PhD, DVM, graduated from Ontario Veterinary College in 2008. She moved to Squamish, BC, where she worked for two years as an associate veterinarian in a small animal practice. She currently travels across BC as a locum and enjoys learning something new from each practice.

<sup>1</sup> <https://www.vetmed.wsu.edu/outreach/Pet-Health-Topics/categories/diseases/salmon-poisoning>

<sup>2</sup> [http://www.pac.dfo-mpo.gc.ca/publications/pdfs/aqua\\_mgmt-gest\\_aqua-eng.pdf](http://www.pac.dfo-mpo.gc.ca/publications/pdfs/aqua_mgmt-gest_aqua-eng.pdf)

<sup>3</sup> <http://bcsalmonfarmers.ca>

<sup>4</sup> <https://www.doh.wa.gov/CommunityandEnvironment/Food/Fish/FarmedSalmon>

<sup>5</sup> <https://wdfw.wa.gov/publications/00922/wdfw00922.pdf>

<sup>6</sup> <https://www.theglobeandmail.com/news/british-columbia/tackling-a-sustainable-industry-for-atlantic-salmon-farming/article23794936/>

<sup>7</sup> Her personal website gives her academic credentials as a two-year Bachelor of Science diploma. <http://alexandramorton.typepad.com/article23794936/>

# A GLIMPSE INTO THE LIFE OF AN ANESTHESIA NERD

BY  
TONI LAOUTARIS, RVT, VTS  
(ANESTHESIA/ANALGESIA)



Surgery technologist performing a sciatic nerve block with an electro-location unit and local anesthetic, prior to cruciate surgery (Tibial Plateau Levelling Osteotomy)

**F**ipping through college program guides, several years out of high school as a young adult and soon-to-be mature student, the Veterinary Technology Program caught my eye. “Sure!” I said to myself. “I love animals and am a bit of a math geek ... let’s go for it.” That was 13 years ago, and little did I know that my original aspiration to graduate and work at a zoo would evolve into a decade-plus-long adventure as an RVT with a specialty in anesthesia.

Anesthesia can be an intimidating subject for most veterinary technologists, and I was certainly no different. I vividly recall the fear of going to class because none of the concepts made sense to me. But somewhere along the line, it started to click. My perspective changed, and I began to view practising techniques and learning about various anesthetic agents, while managing cases under the direction of an anesthesiologist, as a welcome challenge.

Soon thereafter, I learned what a Veterinary Technician Specialist (VTS) was. I attended my first International Veterinary Emergency and Critical Care Symposium in 2013, subsequently networking with VTS technologists who had cultivated successful, fulfilling careers, proving to be the inspiration I needed. I decided that this was a professional achievement that I wanted to work toward.

The process of becoming a VTS is rigorous, to say the least. The first year of the two-year process is taken up with completing the initial application by writing up case logs and reports, while mastering the requisite skills.

A successful applicant spends the second year studying for a one-day exam held in the fall of the year.

Was it all worth it? Absolutely. The skills and knowledge I now use to manage the variety of cases typical for a multi-disciplinary emergency and referral hospital allow me to provide the best possible care for my patients, alleviating pain while keeping them safe and comfortable during sedation or under general anesthesia.

I’m not sure if my fondness for orthopedic cases stems from my initial experiences as a surgery tech or because regional anesthesia is one of my favourite things to include as part of a balanced anesthetic and analgesic plan. Cruciate repair is one of the more common operations in any given surgical service. I mostly have experience with Tibial Plateau Levelling Osteotomies. Performing epidurals was one of the first techniques that sparked my anesthesia nerdiness. I was instantly sold on the fact that there were several advanced techniques that technologists could be trained in and trusted to perform. As time progressed, I became increasingly more proficient at epidurals and peripheral nerve blocks. Some of these require the use of a nerve stimulator such as the brachial plexus block, which provides analgesia distal to the elbow. Electro-location units are used to identify nerves using a short bevelled, insulated needle that allows the injection of local anesthetic around the nerve. Femoral and sciatic nerve blocks are relatively new techniques for me, but I now favour them over epidurals in most of the pelvic limb cases I anesthetize because of their efficacy, safety, and reduction in side effects. Combining these blocks provides analgesia for unilateral procedures distal to the coxofemoral joint, employing nerve electro-location in a similar fashion to the brachial plexus block.

Mechanical ventilation utilizing capnography is another favourite of mine when it comes to all things anesthetic. The majority of cases I manage are mechanically ventilated, not only because I find the anesthetic plane to be more consistent while reducing the percentage of inhalant used, but also because the case itself indicates control of respiration. Many of our neuro patients undergo advanced imaging such as MRI, as part of their diagnostic workup. Patients requiring magnetic imaging must be fully anesthetized, and all employees working with these patients need to be properly trained and screened for safety purposes before entering the MRI suite. I work with a high field 1.5 Tesla MRI and MRI-compatible monitoring equipment

and ventilator. These patients are monitored from the control station, which is outside of the room. Mechanical control of respiration is paramount because the breathing apparatus is far too long for appropriate gas exchange during spontaneous ventilation. It is also impossible to give intermittent positive pressure ventilation by squeezing the reservoir bag during scanning. As with the neuro patients, ophthalmology patients who undergo phacoemulsification must also be ventilated, although for a different reason. These patients are not only anesthetized but are also paralyzed using neuromuscular blocking agents, eliminating their ability to spontaneously ventilate. The same electro-location unit used for peripheral nerve blocks also acts as a nerve stimulator so that the degree of blockade may be qualitatively and quantitatively assessed via train of four stimulation.

Multi-parameter monitoring equipment is placed on all anesthetized patients at our facility. It’s crucial to be able to interpret readings on the capnogram, ECG, and blood oxygen saturation level while obtaining invasive or non-invasive blood pressure readings. This information helps to appropriately manage the patient’s anesthetic plane, analgesic requirements, ventilation, and fluid therapy. Our internal medicine and emergency departments often have unwell or critical patients who require sedation or anesthesia. These patients may need endoscopy, bronchoscopy, exploratory laparotomy, thoracic, or lifesaving surgical procedures. It’s important to closely monitor these dynamic cases, often well into the recovery period.



Monitoring a patient during transfusion



Induction at the MRI

Additionally, inhalant reduction is key for critical patients in order to reduce unwanted vasodilatory effects, helping to maintain adequate perfusion. Minimum alveolar concentration-sparing agents like fentanyl, lidocaine, and ketamine constant rate infusions are commonly incorporated into the anesthetic plan to help reduce inhalant requirements while also providing analgesia. Crystalloids, colloids, blood products, and pressors may also be indicated, case dependent.

I feel very fortunate that, at this point in my career, I have supplementary facets that provide me with professional satisfaction. As lead technician, I—along with a few other extremely talented and knowledgeable senior technologists—am responsible for training and teaching the growing team. I love celebrating the achievements of my fellow RVTs when they nail a difficult calculation, successfully perform their first regional block, place an arterial catheter for invasive blood pressure monitoring, or place a central line in a critical diabetic ketoacidotic patient. These are the moments throughout the day that give me an enormous amount of pride in my teammates.

Writing articles, lecturing, and training on-site at local clinics have also proven to be extremely satisfying. It is very rewarding and motivational to have the opportunity to travel to hospitals or speak at continuing education events while interacting with RVTs who have the desire to learn and improve veterinary medicine within the local veterinary community. It excites me to see what the next decade has in store. I hope to continue to advocate for my patients and for RVTs in the profession, inspiring as many as possible to become anesthesia nerds. **WCV**

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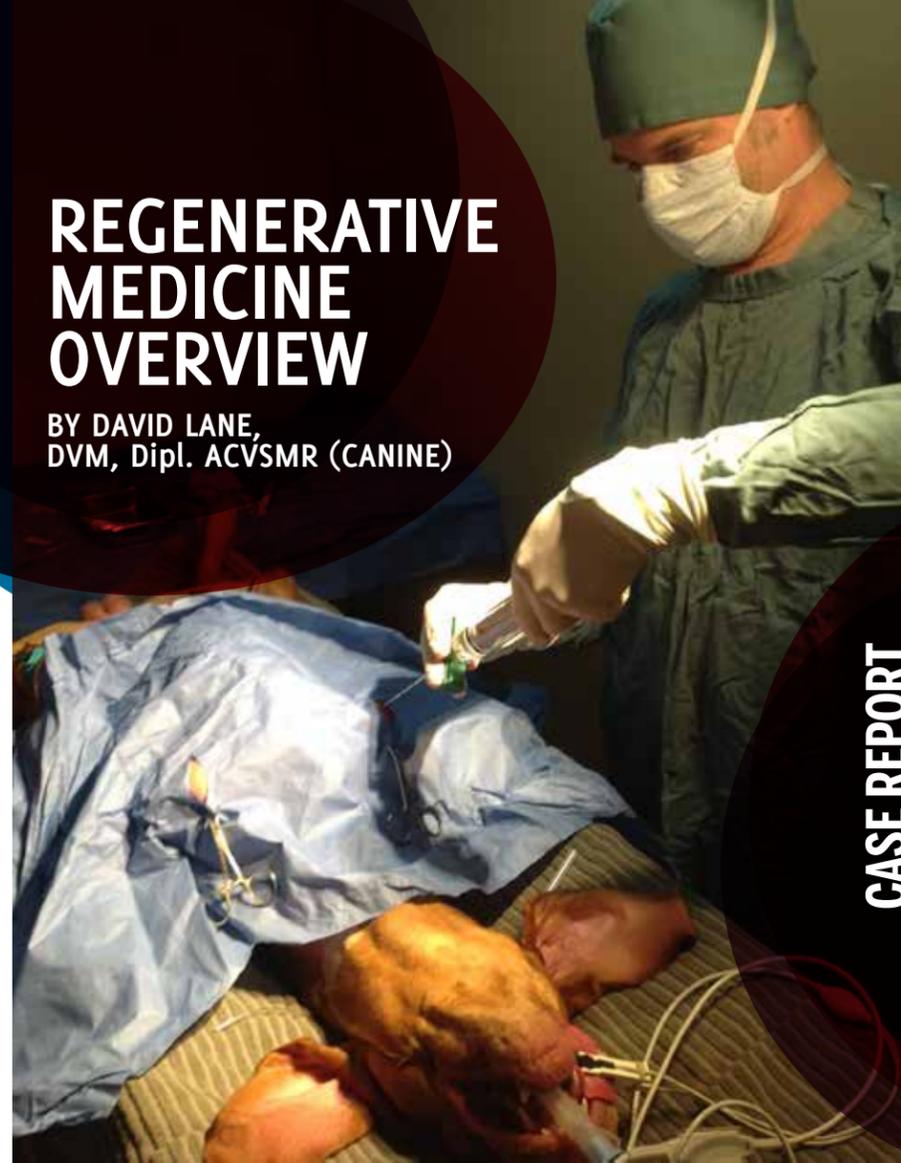
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# REGENERATIVE MEDICINE OVERVIEW

BY DAVID LANE, DVM, Dipl. ACVSMR (CANINE)



## CASE REPORT

Shelby, a five-year-old female Lab, partially tore her biceps tendon during a fall in an agility tunnel. She received a combination of bone marrow aspirate concentrate (BMAC) and platelet-rich plasma (PRP). Eight weeks later, a repeat ultrasound showed substantial regrowth of tendon into the defect. Two years later, she has gone on to set two Canadian dock diving records, as well as earning multiple rally, retrieving, and tracking titles. Although many practitioners recommend transection of the biceps tendon as a first-line approach to treating such cases, regenerative medicine (RM) offers a viable option for actually healing the bicep tendons and returning the shoulder to full function.

A trochar is being used to aspirate bone marrow (BMA) from the humerus into a heparinized syringe.



The BMA is being passed through a filter to remove fragments of trabecular bone.

jointly typically require deeper sedation. Coxofemoral injections are also done under ultrasound guidance.

The utility of PRP in repairing tendons is less certain, and in the case of supraspinatus tendinopathy, has demonstrated less efficacy than Extracorporeal Shock-wave Therapy. Personally, I do not use PRP on its own for tendon repair.

PRP has been shown to have a synergistic relationship with MSCs, by releasing growth factors and cytokines that result in stem cell proliferation, migration, and differentiation. Further, PRP can contribute to the scaffold that MSCs need for tissue repair. When injecting MSCs, I always combine them with PRP for optimal effect.

### PRODUCTS DERIVED FROM ADIPOSE OR BONE MARROW

Although many people associate stem cells with tissue derived from embryos or umbilical cords, such cells are less useful clinically when compared to MSCs. Embryonic stem cells are too mutagenic, with the potential to develop teratomas. Famously, in one research project, this led to the development of intracardiac teeth, which most would consider a suboptimal outcome. MSCs, on the other hand, are more inclined to form tendon, ligament, muscle, cartilage, nerve, or bone.

Technically, when referring to stem cells, I am referring to a pure culture of MSCs with no additional biologic agents. Frequently, these cells have been cultured from an adipose or marrow aspirate that has been submitted to a lab. The lab selects from a line of stem cells, and then expands the number of cells into the tens of millions.

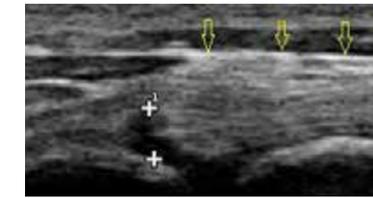
In contrast, techniques that are more common include macerating fat to free up the SVF, which includes a smaller number of stem cells, but also other helpful components such as T regulatory cells, endothelial precursor cells, and macrophages. Similarly, BMAC reflects a mix of many compounds, including MSCs, rather than a pure isolate of MSCs.

So, which works better—cultured MSCs, SVF, or BMAC?

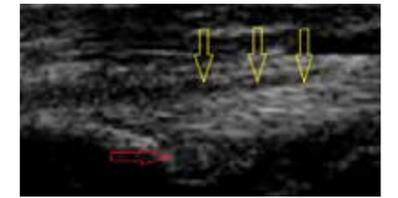
Cultured MSCs have a greater number of cells, but from only one cell line, with no other potentially beneficial components mixed in. Another consideration is that 24 hours of shipping is enough to negatively affect stem cell performance. In contrast, SVF and BMAC have smaller numbers of fresher cells in a milieu of other beneficial agents. At this point, we don't know which is best—a high number of weaker homogenous MSCs, or a sample with fewer but fresher MSCs with additional beneficial molecules. Time and further research should eventually answer this question. One thing that early research is showing, though, is that whether you use cultured MSCs, SVF, or BMAC, results are better when PRP is added to the mix.

Until now, I have been talking about autogenous stem cells—stem cells harvested from a patient and returned

to the same patient. In contrast, allogeneic stem cells are harvested from a donor and then implanted into the patient. MSCs have surface proteins that act like a Harry Potter invisibility cloak, allowing the MSCs to escape detection from the host's immune system. Although allogeneic cells are not yet widely available, the time is coming when it will be possible to store vials of canine stem cells on-site, to be thawed, drawn up, and injected as needed.



Longitudinal ultrasound image of Shelby's biceps tendon at time of diagnosis. The tendon is denoted by yellow arrows, and the tear can be seen as the hypochoic region between the two + symbols.



This repeat image shows how much Shelby's tendon has repaired just eight weeks after a BMAC/PRP injection. The red arrow indicates the site of the previous tear.

### INDICATIONS

The most common application of MSCs has been for palliating arthritic pain. Typically, an MSC injection lasts eleven months—only two months longer than PRP. However, MSCs are significantly more expensive and invasive to collect. Thus, I prefer PRP for routine OA treatment. However, because MSCs have been shown to alleviate maladaptive pain, I do use MSCs with PRP in cases of unusually painful arthritis.

MSC/PRP therapy is particularly effective in the repair of partially torn tendons or ligaments. A recent paper documented the regeneration of partially torn cruciate ligaments after injection of MSC/PRP. Two years following this treatment, only 19 per cent of treated dogs progressed to needing surgery (we would expect 85 per cent of them to progress to surgery within three years if they had received no treatment). Patient selection is key, and surgery is still the most proven therapy, but MSC/PRP may provide an alternative to surgery in some cases.

Research on the utility of RM in treating supraspinatus tears found that 88 per cent of treated patients fully responded, and the remaining 12 per cent showed partial improvement. I'm in the early stages of compiling my own data on the use of MSC/PRP to treat partially torn tendons. Biceps and supraspinatus tendons are the ones I most commonly inject (51 tendons total), followed by the iliopsoas (15), patellar (2), and a single episode each of treating a pectineal, ulnar carpal flexor, and a teres minor tendon. I frequently inject the glenohumeral medial compartment, but often as a presumptive diagnosis of medial shoulder instability unconfirmed by imaging, and usually in combination with other shoulder tendon injuries.

Owner outcome surveys showed that 25 per cent of treated dogs returned to a level of athleticism that exceeded their pre-treatment level (presumably due to the rehabilitation program that accompanies the RM treatment). An additional 60 per cent returned to the same level of function, 10 per cent showed a partial response, and 5 per cent failed to improve. (This last case continues to haunt my sleep. We suspect this patient has a concurrent cervical disc issue that is contributing to the persistent lameness, but the owner has declined an MRI, so this theory remains unproven.) Of the owners that returned surveys, nine of them owned competition dogs. The surveys show that, post treatment, three returned to a level of competition that exceeded pre-treatment levels, five returned to the same level of competition, and one was pulled from competition for reasons unrelated to the injury.

It will take time to sort through which conditions do or do not respond to RM; for those conditions that do respond, it will also take time to determine which form of RM is most effective. Even so, the use of RM is already effecting change in how we treat many tendon or ligament injuries—providing results more positive than have been achievable before. With our understanding of this modality just beginning, we anticipate seeing even better results in the years to come. [WCV](#)

**R**egenerative medicine (RM) is showing great promise in treating several conditions related to musculoskeletal injury or disease. Growth in this field has been so rapid that, in many cases, the clinical application of these techniques is preceding any peer-reviewed research on their effectiveness. Predictably, this creates confusion in understanding which cases may or may not benefit from RM.

RM enhances the body's innate ability to resolve inflammation and regenerate tissue by concentrating reparative elements where they are needed most. Frequently, this involves harvesting cells and growth factors, and injecting them into lesions under ultrasound guidance. The most common sources of such material include peripheral blood, adipose tissue, and bone marrow. Products derived from peripheral blood include platelet-rich plasma (PRP) and Autologous Conditioned Serum (ACS). Products derived from adipose or bone marrow include mesenchymal stem cells (MSCs), stromal vascular fraction (SVF), and BMAC.

### PRODUCTS DERIVED FROM PERIPHERAL BLOOD

PRP is commonly defined as a 3–5-fold concentration of platelets in a small volume of plasma. Once activated, these platelets release multiple growth factors that reduce inflammation and promote neovascularization and tissue repair. ACS is similar to PRP, but with one main difference: instead of relying on increased platelet numbers for its therapeutic effect, serum is incubated in the presence of glass beads to stimulate production of

anti-inflammatory cytokines, particularly IL-1 receptor antagonist protein. In dogs, more research has been done on PRP than on ACS.

Research has consistently shown that PRP significantly reduces arthritic pain in most patients, with approximately 80 per cent showing improved comfort for nine months. If this treatment is coupled with a weight loss and therapeutic exercise program, then the improved mobility often persists even longer. I've used PRP successfully in phalangeal, carpal, elbow, shoulder, tarsal, stifle, and hip joints. Elbows, carpi, tarsi, and stifles can frequently be injected solely under local anesthetic, or a local/Torbugesic combination, which facilitates its use in geriatrics or other anesthetic-risk patients. Hip and shoulder

**“RESEARCH HAS CONSISTENTLY SHOWN THAT PRP SIGNIFICANTLY REDUCES ARTHRITIC PAIN IN MOST PATIENTS, WITH APPROXIMATELY 80 PER CENT SHOWING IMPROVED COMFORT FOR NINE MONTHS.”**

PHOTOS COURTESY OF DAVID LANE



# TAKING WING

## WORKING RAPTORS AT THE AIRPORT

BY KEN LANGELIER, OBC, DVM



PAGE 20 & 21 Peregrine Falcon Boeing clears the airport runways to prevent bird strike; THIS PAGE CLOCKWISE STARTING FROM LEFT Dr. Ken Langelier examining a wild Bald Eagle that was electrocuted when it touched two hydro wires; Examining Dante, a Eurasian Eagle Owl, with Robyn Radcliffe of The Raptors; Katie Radcliffe of The Raptors monitors a Snowy Owl during implant of antibiotic impregnated beads into a foot wound.



We all appreciate a safe flight when travelling, but most people don't know of the unsung heroes at the airport that help prevent bird-strikes and possible disasters for plane passengers. Pacific Northwest Raptors, also known as The Raptors, coordinates bird-strike prevention by keeping gulls, shorebirds, waterfowl, and other birds from many of our airport runways.

Falcons are the jet fighters of the avian world and can use their sharp hallux talons to chase or strike birds in mid-air. Boeing, a six-year-old Peregrine Falcon aptly named after the planes he protects, was par-

the medial condyle of the left tibiotarsal bone. Following general anesthesia, the fracture was examined. The small piece of bone was too difficult to hold in place with Kirschner wires. Normally, bone screws don't have enough bone cortices to work on avian bones, but in Boeing's case, we were running out of options, so I was glad when a small bone screw slid nicely into place. We held our breath as we applied an external splint. We were relying on the fact that bird bones heal very quickly, and in Boeing's case, if we could immobilize the joint for two

**"IF I WAS TOLD IN VETERINARY COLLEGE THAT ONE DAY I WOULD BE WORKING ON THE LANDING GEAR OF A BOEING, I WOULD NOT HAVE BELIEVED IT."**

ticularly gifted and would take on anything from small shorebirds to geese despite his being less than a kilogram in weight. When a large gull moved onto the airfield, Boeing was dispatched, and the gull flew but wouldn't leave the runway, so Boeing stooped from high in the air and hit the gull particularly hard—so hard, in fact, he broke his own leg.

The next flight for Boeing was to our hospital, hitching a ride on the plane he normally protected. Radiographs revealed a fracture of

to four weeks with the bone fragment in that position, it should heal. If I was told in veterinary college that one day I would be working on the landing gear of a Boeing, I would not have believed it.

Avian patients are relatively routine in our hospital as we care for many exotics including pet birds, wild birds, and the 150+ raptors of The Raptors. It is very true that

birds have been designed to fly but not crash. With hollow bones and thin skin over their heavily muscled frame, collisions can be severe if not lethal and often very challenging to repair. On top of that, in falconry, raptors are considered to be working animals and must be able to chase, strike, or capture prey, so any impairment involving their eyes, legs, or ability to fly can be a cause of early retirement. Optimal health is needed along with a good flying weight so that the birds are fit, yet have an appetite to work for their dinner.

Scavenging birds, especially gulls at landfills, have proven to be a problem as they spread garbage away from the intended area, which can both result in damage to machinery, impeding operations, and pose a significant safety hazard. Off site, the gulls can damage neighbouring homes with garbage or their feces where they roost. Spreading of garbage can also affect other forms of wildlife (more rodents) and be a potential health risk. Falconers from The Raptors pay daily visits to landfills to move the gulls on to natural food sources instead.

On Vancouver Island, a non-migratory subspecies of Canada Goose was introduced, and the birds have become a nuisance with their droppings in public parks, schools, and cemeteries. Geese quickly learn to use alternative areas when a predatory raptor begins to visit.

Veterinary care includes regular physical examinations, travel health certification, health care advice, and

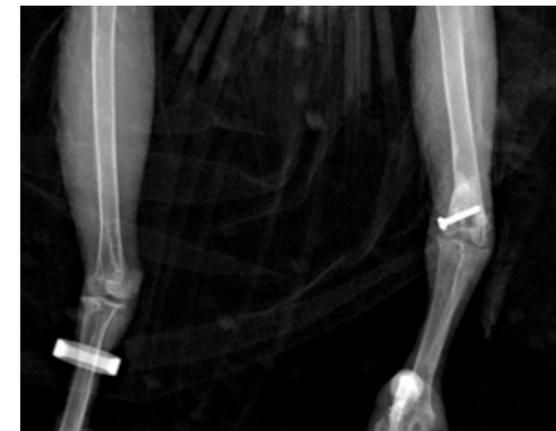
parasite control, as well as emergency medical and surgical care. Before a raptor is flown, the falconer must always assess the immediate environment for danger. This can be in the form of wires, fences, oil, or other dangers that the bird may strike while chasing prey—or in addition, it can be the presence of wild raptors that see the falconer's bird as competition or food. On several occasions, even the falconer was not able to spot a wild raptor in the area, resulting in the falconer's bird being attacked. One bird in particular, Ace, had the wing web of one wing shredded by an attacking falcon. After sorting out the pieces of skin, I was pleased to see the long thin propytagium ligament on the leading edge of the wing web (essential for flying) had not been severed. Fortunately, as well, the skin and severed

**"BEFORE A RAPTOR IS FLOWN, THE FALCONER MUST ALWAYS ASSESS THE IMMEDIATE ENVIRONMENT FOR DANGER. THIS CAN BE IN THE FORM OF WIRES, FENCES, OIL, OR OTHER DANGERS THAT THE BIRD MAY STRIKE WHILE CHASING PREY—OR IN ADDITION, IT CAN BE THE PRESENCE OF WILD RAPTORS THAT SEE THE FALCONER'S BIRD AS COMPETITION OR FOOD."**

muscles were not devitalized, and when they were all sorted and sutured together, we were pleased that the wing healed well and was fully functional for hunting again in a few months.

The film industry and commercial photography industry in Canada are doing well, and raptors are often needed on set but first must be given a veterinary health certificate. The Raptors have done many commercial shoots and filmings, including *The Big Year*, *Air Buddies*, and *A Series of Unfortunate Events*, along with many other films and commercials.

Birds used for falconry are bred at the centre, and the breeding program is needed to meet the growing demand of non-toxic pest bird control—an environmentally friendly alternative. On the veterinary side, some birds are paired for breeding but may not like their chosen mate at first, and thus beak and talon injuries are occasionally seen at our hospital.



LEFT TO RIGHT Small bone screw held the fractured bone fragment long enough for Boeing's leg to heal; A Peregrine Falcon clears gulls from landfills.



PHOTOS COURTESY OF KEN LANGELIER



**CLOCKWISE STARTING FROM TOP LEFT**

Canada Geese flee a cemetery after Lulu, a Harris's Hawk, is flown towards them by Gerard Duncan of The Raptors; Bald Eagle nestling 'Sir Claws' fractured his wing leaving the nest. A few cerclage wires (see next page) held the humerus together, allowing healing; Olivia learns about birds of prey and falconry at a Hawk Walk at the Raptor Centre; Two young Harris's Hawks are taken from the incubator to examine. Captive rearing provides raptors for future falconry work.



**"NORMAL DEBRIDING AND FLUSHING WITH DRAINAGE, AS DONE IN MAMMALS, DOES NOT WORK IN BIRDS."**

quickly released, but the other had an incidental finding of a barbecue skewer present in his stomach. The skewer had probably been scavenged from someone's meal or discarded garbage. The skewer had penetrated the stomach and was up against and almost penetrating the spinal column. The abdomen was explored, and the skewer was surgically extracted, with the eagle soon healing well enough for release.

Wild birds will often fall from nests, and tree climbers are available to return birds to their nests, make new nests if needed, or place the nestling in with new foster parents (as long as the nestling is of a similar size, they are readily accepted). Occasionally, the nestling bird sustains a severe injury from the fall; one such bird was a Bald Eagle nestling that fractured his humerus. The perfect oblique mid-shaft fracture lent itself to using cerclage wires only (no IM pins), so I named the eagle Cerclage. I chuckled when I saw that his name had been misinterpreted at the rehabilitation centre, and he was now Sir Claws.

Infectious disease is always a concern, especially with the raptors interacting with wild birds. Some species are especially susceptible to aspergillosis, and constant monitoring for this threat must be done. We have received birds with bumblefoot (pododermatitis) or deep infected wounds and have had success using antibiotic-impregnated polymethylmethacrylate beads placed in the infected site. Normal debriding and flushing with drainage, as done in mammals, does not work in birds. Another concern with birds with open wounds is that we must also be aware when flushing that birds have pneumatic bones that connect to airways. Even the femur in raptors (not psittacines) is pneumatic and requires special consideration when repairing or treating open fractures.

Raptor veterinary medicine will always remain very challenging with the fragility of the patients and limitations of information and instrumentation. Seeing a bird fly that was once grounded can be very rewarding. It has been two years since Boeing's injury, and we are proud to say he is still protecting our airways, although I have never asked how they explain the metal screw in his leg when they take him through airport security.

For further information on The Raptors Centre, located in Duncan, please visit <http://pnwraptors.com/>. [WCV](#)



**ABOVE** Robyn Radcliffe releases a Bald Eagle following injuries sustained in a fight and surgical removal of a barbecue skewer from his stomach. **RIGHT** Part of the public education program, Barn Owl Luna flies in a flight demonstration.



**INTERESTING FACT**

Did you know that falconry is one of the oldest relationships between humans and birds, dating back over 4,000 years? In 2016, "Falconry, a living human heritage," was inscribed on UNESCO's Representative List of the Intangible Cultural Heritage of Humanity.



Sir Claws was aptly named for the cerclage wires on his humerus.



A radiograph of Spectacled Owl Elton reveals his ingested transmitter.

Pediatrics in neonatal hatchlings can also be a difficult task, with each raptor species having its own special needs for housing, nutrition, and disease control.

In a world where raptors and vultures are struggling to survive, another important mission of The Raptors is public education. The centre is open to the public with display birds and regular flight demonstrations. These include many aspects of birds in flight including listening to the silence of owls in flight, Bald Eagles picking

**"ELTON, A SPECTACLED OWL, IS VERY DEXTEROUS WITH HIS MOUTH AND ONCE MANAGED TO REMOVE AND SWALLOW HIS ENTIRE RADIO TRANSMITTER OFF HIS TAIL."**

up prey in water, pack hunting of Harris's Hawks, and the fast stoop of a falcon striking a lure in mid-flight. During these tours and demonstrations, the public is educated on the anatomy, species variations, nutrition, and conservation needs of raptors. I have attended many of these demonstrations and never tire of watching the magic of birds performing when they have the choice of flying away (which every once and a while the odd bird chooses to do).

Birds are fitted with radio-transmitters in the event they do decide to fly away. Elton, a Spectacled Owl, is very dexterous with his mouth and once managed to

remove and swallow his entire radio transmitter off his tail. As soon as it happened, staff rushed him to the hospital. In exotics, one often learns how to MacGyver items to aid in procedures not normally done in pets. Rather than explore through the abdomen to remove the radio transmitter, we elected to take a plastic casing off a urinary catheter holder and cut it to the length needed to reach the transmitter. After anesthetic induction, an otoscope light and long alligator forceps were used to remove the radio transmitter. Surprisingly, in the short time since Elton ingested the transmitter, his stomach acids had already begun to dissolve the casing around the transmitter exposing the corrosive battery acids.

This was not to be Elton's only incident, and later I had to remove a large primary feather that he had rolled up, swallowed, and got stuck in the back of his throat. Elton is a very special owl at the centre as members of the public often use him when they take short courses on falconry at the centre. My daughter, Caitlin, learned about falconry as a teenager and, at the end of her internship, had to give a public demonstration and lecture on the Spectacled Owl, using Elton.

Additional hands-on public education is done on Hawk Walks where members of the public take a walk through nearby forests with a hawk following them and flying to their gloves at various times throughout the walk. Special fundraising events for helping wild raptors are often hosted at the centre. A popular event, International Culture Awareness Weekend, highlights the plight of rapidly declining worldwide populations of vultures from poisonings. Owl-o-ween has a special focus on owls in the evenings near Halloween.

Further to their commitment to raptors, the biologists and falconers of The Raptors also volunteer their time and expertise to help with the nearby Raptor Rescue Society which captures and cares for sick and injured raptors on Vancouver Island in the hope that they can be released back into the wild. On one occasion, two Bald Eagles were brought in that were in a serious territorial battle with one another and had to be netted out of the water. One bird had only a few punctures so was dried and

# MANAGEMENT OF TRAUMATIC WOUNDS

## A BRIEF OVERVIEW

BY CHRIS JORDAN, Bsc (Hons), BVetMed, Dipl. ECVS, MRCVS

**TWO DIFFERENT DOGS, TWO DIFFERENT WOUNDS, BUT ONE QUESTION: HOW WOULD YOU TREAT EACH DOG?**

No two patients with a wound are the same, and all require a tailored management plan. Yet there are both similarities and differences in how you would treat the wounds in each of these dogs. By knowing the salient aspects of each management step, you can optimize the outcome of any cat or dog that you may see with a wound by following a framework for pragmatic and appropriate management.



### THE FIRST CASE

A four-year-old, neutered male Cane Corso, was presented shortly after having suffered a 30cm, full-thickness laceration of the left pelvic limb from the craniolateral proximal crus to the dorsomedial aspect of the tarsus from which there was significant active hemorrhage and a transected tendon protruding.



### THE SECOND CASE

An eight-year, eleven-month-old neutered male West Highland white terrier, presented shortly after having been attacked by a dog. The case had puncture wounds to its ventral cervical region with significant local inflammation and was dyspneic.

**“THE SKIN HAS A HIGH PROPORTION OF NOCICEPTORS, SO INJURY TO THE SKIN IS INTENSELY PAINFUL. APPROPRIATE ANALGESIA WILL VARY SIGNIFICANTLY FROM CASE TO CASE BUT UNLESS PRECLUDED SHOULD ALWAYS INCLUDE OPIOIDS AND NON-STEROIDAL ANTI-INFLAMMATORY DRUGS (NSAIDS).”**

For the purpose of this article, we will consider that these two cases have the described wounds in isolation.

### PERSONAL PROTECTIVE EQUIPMENT

All staff dealing with any case with a wound should wear appropriate PPE including disposable gloves to mitigate nosocomial infection and hospital contamination.

### PATIENT ASSESSMENT AND STABILIZATION

All cases with wounds will have suffered trauma, so perform immediate triage of every trauma case to include a full-body-system evaluation to identify all lesions, place them in order of clinical urgency, and prioritize their management. A minimum database should be obtained to include packed cell volume and total solids, blood urea nitrogen, and glucose.

**CASE 1** was mildly tachycardic and had hyperdynamic peripheral pulses likely due to its having lost a significant amount of blood, so was given a 10ml/kg bolus of crystalloids following which it became normocardic and normotensive.

**CASE 2** was dyspneic, so was placed in an oxygen cage. Could the dyspnea in this case be due to stress, pain, local swelling, or a respiratory system lesion?

### CLASSIFY WOUND

It is important to appropriately classify every wound (size; type, e.g., laceration/shear/puncture; location; partial thickness vs. full thickness; tissues involved; time frame since injury; etc.) as this will focus you to consider the etiopathogenesis of the wound and likely sequelae and thus enable you to tailor an appropriate management plan to each patient.

**CASE 1** has a 30cm, full-thickness laceration of the left pelvic limb from the craniolateral proximal crus to the dorsomedial aspect of the tarsus from which there was moderate active hemorrhage and a transected tendon protruding.

**CASE 2** has puncture wounds to its ventral cervical region with significant local inflammation.

### ANALGESIA

The skin has a high proportion of nociceptors, so injury to the skin is intensely painful. Appropriate analgesia will vary significantly from case to case but unless precluded should always include opioids and non-steroidal anti-inflammatory drugs (NSAIDs).

Local anaesthetics are extremely effective so should be considered in every case by way of a topical ‘splash’

block; ‘ring’ block; brachial plexus blocks; radius, ulnar, and median nerve block; femoral and sciatic nerve block; or epidurally.

Gabapentin is an excellent and cheap analgesic with minimal side effects and has been shown to mitigate upregulation of chronic pain pathways which can remain activated long after gross wound healing.

Alpha 2 agonists are good analgesics which can also be effective sedatives if sedation is required.

The presence or absence of a neurological lesion may significantly alter the prognosis, so it is important that a neurological examination be performed prior to administering any drugs which may alter the examination, e.g., for a case with a deep laceration to the caudolateral thigh, should analgesia or sedation have been administered prior to neurological examination, would a lack of a withdrawal reflex be due to the patient being analgesed/sedated or due to transection of the sciatic nerve?

**CASE 1** had a deep laceration with concurrent transection of a tendon and blood vessels, so a local nerve could also have been transected. Neurological assessment of the effected limb was performed during immediate triage and prior to administration of any analgesics. The neurological assessment was within normal limits confirming that no significant nerve injuries had occurred, so hydromorphone was administered. Administration of NSAIDs was initially precluded by the suspicion of significant blood loss and associated hypovolemia and concern for an NSAID-associated coagulopathy. A femoral and sciatic local anesthetic block was performed pre-operatively. NSAIDs were only administered when the patient had fully recovered from anesthesia, was normotensive and euvolemic, and in-house biochemistry had confirmed normal renal and hepatic function.

**CASE 2** was dyspneic. Opioids can cause respiratory depression, so hydromorphone was administered at a low dose to reduce respiratory depression. Additionally, a low dose of dexmedetomidine was administered to provide very mild sedation as well as analgesia.



### WOUND FIRST AID

Initially, consider whether the wound could be life threatening either through the current extent of the lesion or sequelae to the lesion—any concerns should be immediately addressed.

All wounds should be covered, even with a light dressing, to mitigate nosocomial infection and hospital contamination. Should wound-induced local instability have the potential to lead to further trauma to local tissues, a supportive dressing should be placed.

**CASE 1** had moderate active hemorrhage, so a pressure dressing was placed initially to provide temporary hemostasis. Once stabilized, the patient was anesthetized, the dressing was removed, and the lacerated vessels were found to be hemorrhaging so profusely that they were immediately ligated with the patient still in the induction area.

**CASE 2** once stabilized had a light neck wrap dressing placed very loosely so as not to further exacerbate the patient's dyspnea.

#### INITIAL WOUND ASSESSMENT

Fully assess each wound to identify exactly which structures have been or could have been damaged, ideally under general anesthesia or heavy sedation if the patient is stable enough.

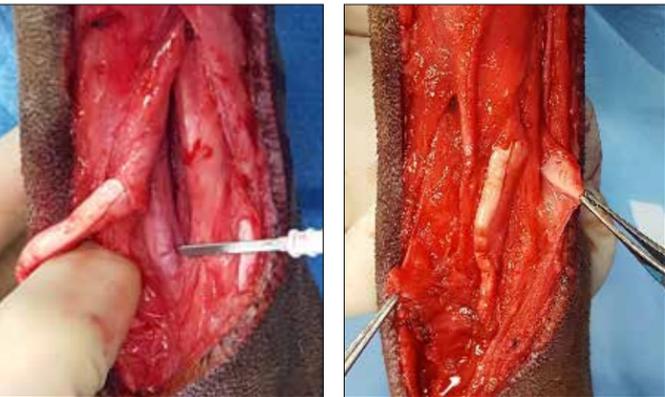
If you are not familiar with it, review the local anatomy to comprehensively identify which structures have been damaged and what other structures may have been damaged.

**“IMPORTANTLY, WITH WOUNDS TO THE LIMBS, CONSIDER AT WHAT STAGE OF LOCOMOTION THE WOUND MAY HAVE OCCURRED, THUS WHICH STRUCTURES—PARTICULARLY TENDONS—MAY HAVE BECOME DAMAGED.”**

Importantly, with wounds to the limbs, consider at what stage of locomotion the wound may have occurred, thus which structures—particularly tendons—may have become damaged. Assess which regions of the limb a wound lies over while moving the limb through a full range of motion. Assess local joints for crepitation and instability.

Where indicated, radiography and other imaging modalities should be used to assess for lesions that are not grossly visible and to assess the full extent of visible lesions.

**CASE 1** had an extensive skin wound making it easier to assess exactly which tissues had been traumatized. This case had lacerations to branches of the dorsal pedal artery which were ligated soon after induction to



anesthesia; there was transection of the tendon of the tibialis cranialis and transection of the crural extensor retinaculum. The distal aspect of the tendon of the tibialis cranialis could not be identified even with ipsilateral tarsal flexion. Additionally, there was a superficial laceration to the tunica adventitia of the dorsal pedal artery—had this vessel had a full thickness laceration, the patient would have been likely to have exsanguinated prior to presentation.

**CASE 2** had puncture wounds; subcutaneous damage associated with puncture wounds must be assessed through surgical exploration due to an unknown depth of penetration and the inherent mobility of cat and dog skin allowing anything puncturing the skin to have the potential to damage subcutaneous structures over an unknown area. This case was dyspneic, so thoracic radiography was performed which identified gas in the cervical fascial planes, pneumomediastinum, and pneumothorax.

#### CLIP ALL HAIR FROM AROUND THE WOUND

Fill the wound with sterile lubricant and clip all hair from around the wound at least far enough from the margins of the wound to prevent hairs from protruding in to the wound. If clipping of hair reveals more wounds or contusions, continue clipping until it is clear that normal skin has been exposed, to ensure the extent of the wound has been identified.



#### DECONTAMINATE THE WOUND

Decontamination should be performed as soon as possible but ideally within six hours of the wound occurring and definitely within twelve hours to remove the majority of bacteria.

Wear sterile gloves to improve dexterity and allow deep exploration of larger wounds.

Remove any gross debris.

Lavage the wound with copious amounts of fluid. Sterile isotonic crystalloid is recommended because no benefit of antiseptic solutions for wound lavage has been demonstrated. Additionally, no contraindications of

using tap water to lavage wounds have been demonstrated; in fact, for severely contaminated lesions, consider using a ‘tub table’ and associated hose to decontaminate a wound.

A 35ml syringe and 18-gauge needle have been shown to generate an appropriate pressure for wound lavage through providing enough pressure to remove bacteria and debris from a wound but not too much pressure as to lead to further tissue damage. A ‘three-way tap’ and giving set can be attached to a 35ml syringe and 18-gauge needle to facilitate lavage. Alternatively, a crystalloid fluid bag in a pressure infusion bag with an 18-gauge needle on the end of a giving set can be used. Should a wound have subcutaneous ‘pockets,’ consider swapping an 18-gauge needle for an 18-gauge intravenous catheter which can be introduced in to subcutaneous pockets to facilitate a more thorough lavage.

Chlorhexidine should not be used on wounds because it is cytotoxic.

**CASE 1** had wound lavage performed using a 35ml syringe and an 18-gauge catheter on a ‘three-way tap’ with a giving set from a bottle of sterile isotonic saline attached to the third port.

#### DEEP CULTURE

Following decontamination, take a deep swab of the wound for culture; this does not necessarily need to be sent for culture and sensitivity but is useful to submit for culture and sensitivity should a wound not respond appropriately to empirical antibiotic therapy.

Culture of swabs of the superficial aspect of a wound often does not represent the bacteria deeper in the wound.

#### ANTIBIOTIC THERAPY

Broad spectrum antibiotics should be administered intravenously as soon as possible but after a deep culture swab has been obtained. The duration of antibiotic administration required will vary from case to case but up to 48 hours of intravenous antibiotics followed by 5 days of oral antibiotics is sufficient for the majority of cases.

**“SHOULD SURGERY BE INDICATED, CHLORHEXIDINE SHOULD NOT BE USED TO ASEPTICALLY PREPARE THE SURGICAL SITE BECAUSE IT IS CYTOTOXIC; ASEPTIC PREPARATION FOR SURGERY SHOULD BE PERFORMED WITH DILUTE POVIDONE IODINE.”**

Should there be a risk of septic arthritis, oral antibiotic therapy should be extended to four weeks.

For cases with wounds that are left to heal by second intention (spontaneous healing through granulation tissue formation, then epithelialization) or for which third intention apposition (surgical apposition over a healthy granulation tissue bed) is planned, antibiotics should be continued until healthy granulation tissue covers the wound at which stage antibiotic therapy can be discontinued.

#### INITIAL MANAGEMENT PLAN

It is not possible to fully assess the extent of subcutaneous damage associated with puncture wounds without surgical exploration due to an unknown depth of penetration and the inherent mobility of cat and dog skin allowing anything puncturing the skin to have the potential to damage subcutaneous structures over an unknown area.

Should surgery be indicated, chlorhexidine should not be used to aseptically prepare the surgical site because it is cytotoxic; aseptic preparation for surgery should be performed with dilute povidone iodine.

Prior to surgically exploring a wound, review the local anatomy to enable comprehensive identification of which structures have been damaged and what other structures may have been damaged. Often, it is preferable to explore a wound from a local surgical approach that you are familiar with or can obtain a reference source for, as this will mitigate iatrogenic damage to local structures. For example, for exploration of a cervical wound, ventral midline cervical exploratory surgery is the preferable surgical approach.

Should any structures be unequivocally devitalized, they should be excised to mitigate inflammatory mediators and infection; if you are unsure whether a structure is devitalized, re-assess five to seven days later.

Following completion of surgical exploration, the surgical site should be thoroughly lavaged.

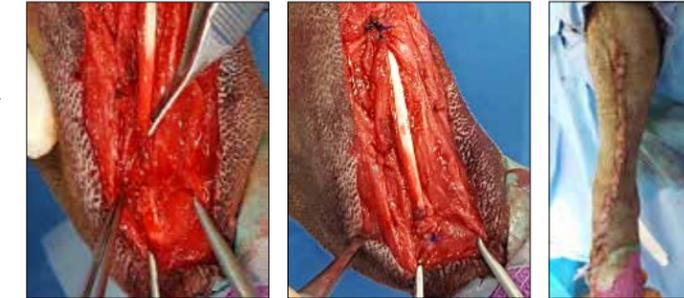
Wounds with severe contamination, wounds with equivocally viable tissue, wounds with any reason to suspect a crushing component, and bite wounds should not be primarily closed, as dehiscence is likely. Crushed and/or devitalized tissue may only manifest at up to seven days after injury. Any wounds satisfying one or more of the above criteria should be managed with dressings and staged debridement for five to seven days at which stage the management plan can be finalized.

Wounds that can be effectively decontaminated can be closed primarily, where possible.

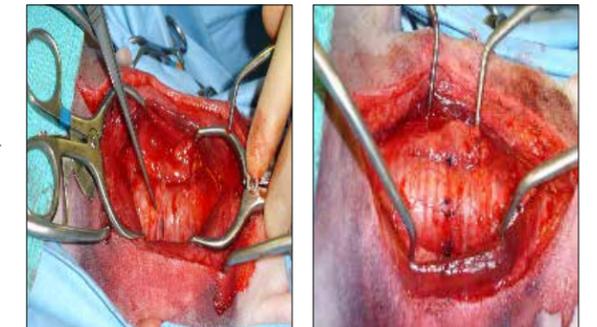
If a large amount of effusion is predicted, consider leaving the wound fully or partially open with closure planned by second intention or delayed primary closure, or consider placing a drain. If a drain is placed, it should always exit the surgical site through a separate incision through healthy skin. If an ‘open’ drain (such as a Penrose drain) is placed, the external portion of the drain should always be covered by a dressing to mitigate nosocomial infection and hospital contamination. Drains should be removed when the effusion has significantly reduced, and/or the effusion cytology is only nondegenerate neutrophils with no intracellular bacteria.

**CASE 1** had a transection of the tibialis cranialis with the proximal aspect of the tendon protruding from the wound, but the distal aspect was not visible even when the ipsilateral tarsus was manipulated through a

normal range of motion. At surgery, the skin laceration was extended distally over the medial aspect of the tarsus for another 5cm, which enabled identification, and retrieval of the distal end of the lacerated tendon of the tibialis cranialis. Due to the laceration having occurred less than six hours prior to initial surgical management, the tendon of the tibialis cranialis was re-apposed, the crural extensor retinaculum was re-apposed and primary closure was performed. A splinted dressing was placed post-operatively to limit tarsal extension to protect the tenorrhaphy and retinacular repair.



**CASE 2** a ventral midline cervical exploratory surgery was performed which identified a laceration of the trachea. The laceration to the trachea was primarily closed, then the surgical site was primarily closed.



#### ONGOING MANAGEMENT PLAN

If a wound has been primarily closed, a light dressing should be placed for at least 48 hours post-operatively.

If a wound has not been primarily closed, ongoing dressing management will be indicated. The type of dressing used and frequency of dressing changes will depend on wound stage (inflammatory, debridement, proliferation, maturation/remodelling). All wounds left to heal by second intention should be covered with a dressing at least until healthy granulation tissue covers the wound; however, should there be a risk that the patient may traumatize the granulation tissue, the wound should remain covered with a light dressing until epithelialization is complete.

Importantly, should a wound be left to heal by second intention, to mitigate unwanted sequelae such as loss of local joint range of motion, physical therapy should be started as soon as the patient is comfortable.

If you are not comfortable managing a case, contact a surgical specialist to discuss the case. [WCV](#)

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1. American Association of Equine Practitioners. *Equine Influenza*. Available at: <https://aaep.org/guidelines/vaccination-guidelines/risk-based-vaccination-guidelines/equine-influenza>. Accessed October 2017.  
2. World Organisation for Animal Health (OIE). *OIE Expert Surveillance Panel on Equine Influenza Vaccine Composition, OIE Headquarters, 22 March 2017: Conclusions and Recommendations*. <http://www.oie.int/our-scientific-expertise/specific-information-and-recommendations/equine-influenza>. Accessed October 2017.

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## SUPPORTING THE MARGINALIZED IN OUR COMMUNITIES

BY SHAWN LLEWELLYN, DVM



Paws for Hope

### “STRENGTHENING THE BOND BETWEEN ANIMAL AND HUMAN GUARDIAN FOSTERS A CONNECTION THAT RUNS DEEP AND BUILDS ON THE SUPPORT NETWORK PEOPLE HAVE IN THEIR COMMUNITY.”

It is a busy start to the morning at McLaren House in downtown Vancouver, as the schedule for appointments with veterinarians is fully booked and a fit-in list has already been started. The staff at McLaren Housing Society has organized appointments for pets of both residents and homeless guardians to be seen today. The team of volunteers for the no-cost animal health clinic includes veterinarians, registered veterinary technicians, and assistants, along with students from Douglas College’s veterinary technology and psychiatric nursing programs.

Over the course of the clinic, veterinary professionals will examine and vaccinate pets as well as educate guardians on their pets’ health and wellness. Deworming, pet food, supplies, grooming services, and free spay/neuter referrals will be provided, and minor medical conditions treated. Any complex conditions identified requiring a more thorough workup are referred to neighbouring veterinary clinics where they will receive the further care they need.

In this morning’s clinic, Teddy, a five-year-old Chihuahua cross, was brought to the clinic by his guardian, Jeremy. Jeremy recently adopted him from a friend he came to know during his time living on the streets. Teddy’s original guardian was unable to keep him when he moved into community housing that was not pet friendly. Luckily, he trusted Jeremy, and Jeremy was able—and more than willing—to adopt Teddy.

Jeremy was concerned that Teddy seemed to be taking longer to eat than usual. On Teddy’s examination, it was determined he had stage four periodontal disease and would require multiple extractions. Teddy was referred for further workup including blood work in preparation for dental surgery. Jeremy was grateful for the support he was given to get his closest friend and companion healthy and happy again. In the end, Teddy had ten teeth extracted, but will be healthier because of it. Jeremy was educated on the importance of oral care and has committed to working on maintaining Teddy’s dental health through regular teeth brushing.

Animal health clinics for the marginalized began on the notion that providing care to the pets of those in need supports not only the animals but also the more marginalized in our society. Strengthening the bond between animal and human guardian fosters a connection that runs deep and builds on the support network people have in their community.

Pets of the homeless and those most vulnerable provide necessary companionship and a structure to daily life that has proven to be life-altering in numerous instances. From the stories we are told as we build relationships with people and their pets, we learn of the lives that have been saved because of a pet coming into the care of a previous drug user or someone who was contemplating suicide. The human–animal bond is known to enhance psychological and emotional wellbeing and, in many circumstances, can be critical to people seeking further community supports and ultimately gaining a foothold back to some form of stability in society.

Some people may believe that pets of the homeless are not well cared for; however, this is a misconception. The volunteers at the numerous clinics throughout the province can attest to the care and wellbeing

provided by these pet guardians. Data shows that homeless pet guardians have significantly higher mean scores on attachment to their pets compared to the population as a whole, and that their pet is important for their mental and physical health. One barrier to pet ownership that is often raised is housing. Many homeless pet guardians choose to remain on the streets due to inadequate housing options that allow pets. They choose their pet, often their sole companion, over affordable housing or a shelter environment. More pet-friendly housing options are becoming available, but there is still a lack. The site of today’s clinic, McLaren House, is one of those pet-friendly affordable housing organizations. McLaren Housing Society believe in the human–animal bond, as staff have witnessed time and again how a pet can help combat isolation, depression, and other mental health issues.

Research shows that animal companions help street-involved youth cope with loneliness and improve their sense of wellbeing through unconditional love. It also shows how pets motivate positive change, such as decreasing drug and alcohol



The Canadian Animal Assistance Team

use. While pet guardianship provides many liabilities, companion animals offer both physical and psychological benefits that youth otherwise have difficulty attaining.

Veterinarians can build upon the bond that exists between pet and guardian. Opportunities for veterinarians include volunteering for an animal health clinic or running one in the community, partnering with an organization to provide support to those in need, donating supplies or preventive medications such as parasite control, fundraising for a community program, support and/or sharing stories of the work being done through social media networks. Many BC organizations and programs support the homeless and marginalized, including The Canadian Animal Assistance Team, Charlie’s Food Bank, Paws for Hope Animal Foundation, Vets for Pets Victoria, and One Health Clinic.

Pets serve as a meaningful source of constant companionship and support for the homeless and marginalized. This companionship has thwarted the worst effects of depression and helps those contemplating suicide regain an element of mental wellbeing and purpose. In line with that, veterinarians can, and do, play a leading role in the support and recognition of this influential human–animal relationship. Veterinary professionals help promote the health and wellbeing of both the animals and people involved, further strengthening an everlasting bond. [WCV](#)



Vets for Pets Victoria

## DID YOU KNOW?

Right now there are dozens of classified ads for job postings at [www.canadianveterinarians.net/SBCV/classified-ads.aspx](http://www.canadianveterinarians.net/SBCV/classified-ads.aspx).

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If you want to hire a student, or you are a student wanting to come back to BC for summer employment, simply visit our BC classified ads at [www.canadianveterinarians.net/SBCV/classified-ad-form](http://www.canadianveterinarians.net/SBCV/classified-ad-form). This is just one more way the CVMA-SBCV Chapter helps its BC members.

### IT’S OKAY TO ASK FOR HELP

## The Homewood Health Employee and Family Assistance Program

Distress Phone line is available 24/7 to all British Columbia veterinarians:

1.800.663.1144

1.888.384.1152 (TTY)

[www.homewoodhealth.com](http://www.homewoodhealth.com)

Additional mental health and wellness resources are listed at: [www.canadianveterinarians.net/documents/mental-health-support-resources](http://www.canadianveterinarians.net/documents/mental-health-support-resources)

## COMMITTEE ACTIVITIES

The Animal Welfare Committee recently sent its delegate, Dr. Clare Tompkins, to the Canadian Violence Link Conference.



In December 2017, I was fortunate to be chosen as a delegate at the first annual Link conference in Ottawa. This conference, hosted by the Canadian Federation of Humane Societies, brought together stakeholders from different areas of society to look at the link between domestic violence and violence against animals. Attendees included police officers, women's shelter workers, SPCA members, social workers, counsellors, veterinarians, RAHTs, elected officials, animal shelter workers, bylaw officers, animal rescue groups, psychologists, and lobbyists. These diverse groups listened to lectures and collaborated in smaller groups to join forces to identify issues, share knowledge, and devise solutions to both assist victims of violence and prevent continuing violence through early intervention.

The connection between violence against humans and violence against animals has long existed, but scientific data was lacking until researchers started asking the right questions. Plenary speaker Frank Ascione, PhD, a Utah-based researcher who focuses on the prosocial and antisocial behaviour of children, stated that the link between violence against humans and violence against animals has always been there, but has not been highlighted as a standalone issue within the literature. In 1997, he conducted a survey for residents of women's shelters in 50 states that included specific questions about their abuser's attitudes and actions toward pets within the family, and if their children had witnessed any violence toward animals. The data revealed that 80 per cent of women respondents talked about animal abuse, and 60 per cent of children talked about abuse, drew pictures of it, or demonstrated it with stuffed toys. At the time, however, shelters did not routinely ask about animal safety at home when someone was admitted. Since the inclusion of questions about abusers' attitudes toward pets, and about pets left behind, on women's shelter intake forms, we now have quantitative data to prove that there is a correlation.

Any doubt of a connection between animal and human violence is dispelled by Dr. Ascione's surveys, revealing that in families with women who were victims of domestic violence, 54 per cent reported their spouse killing or hurting a pet, compared to only 5 per cent of reports of the same in families without domestic violence. These statistics are corroborated by the abusers themselves, with two other studies finding that 41 per cent of men arrested for domestic violence admitted to violence against pets, and 50 per cent of men incarcerated for domestic violence confessed to hurting or killing animals.

Another survey showed 66 per cent of children admitted to shelters had witnessed abuse of their pets. Half had tried to protect their pets. While this could be dangerous, it does show that they have empathy and that not all who witness violence are destined to repeat it. Children are resilient, and most children who grow up in households with intimate partner abuse and animal abuse score favourably on measures of mental health. But those children with existing behavioural or psychological problems, or those lacking social supports, may not fare as well in the future.

How does this knowledge relate to veterinarians in daily practice? Margaret Doyle, Forensic DVM with the Calgary Humane Society, spoke on increasing veterinary recognition and reporting of animal crime. Veterinarians are often the first professionals to become aware of animal abuse and have an opportunity to intervene for the benefit of the animal and the family. Abuse of an animal is not always associated with domestic violence, but it can be a red flag and indicative of a larger problem. Each case must be handled diplomatically, and most accidents are truly

accidents. Some situations that are initially perceived as abuse may instead be a result of miseducation, and clients may require assistance with finding an appropriate way to treat the issue. Indications that an animal may be a victim of intentional abuse are similar to those of domestic abuse and include injuries inconsistent with the history, recurrent traumatic injuries, and vague explanations for injuries. Veterinarians are legally obligated to report animal abuse, cruelty, and distress. As citizens, we are also legally obligated to report child abuse and, if we suspect an adult person is being victimized, we can reach out and discreetly provide contact information for support services in the community. We might assume that such things do not occur in one's practice due to a favourable area and clientele, but interpersonal violence and animal abuse are not restricted to a particular socioeconomic class. Non-accidental injury should be added to our diagnostic differential list so that we are open to the idea when it does occur.

There are other ways we can support victims of violence. Simple things such as displaying pamphlets for social services or local women's shelters in the clinic waiting room might provide information to someone who is otherwise unable to access it. We can also take steps to get to know individuals in our community from other fields, such as social workers, police officers, and SPCA constables, so that if a questionable case arises, there is already an existing network and familiar faces.

Veterinarians, RAHTs, and clinic staff are in an ideal position to join forces with local women's shelters and set up fostering systems to take in the pets of families in need of shelter. According to Amy Fitzgerald, PhD, a criminology professor at the University of Windsor, 56 per cent of women entering a shelter delayed leaving home because they were concerned for their pet's safety, and 47 per cent would have left their abuser sooner if their pet could accompany them to the shelter. One third considered returning to their abuser because he had their pet. Pets can be threatened or harmed as coercion or revenge. Women's shelters are aware of this need, but often cannot accommodate pets due to space restrictions, safety concerns, and allergies. An animal foster system involves recruiting foster homes, training foster families, responding to short-notice pickups of animals, and fundraising to feed and care for the animals. Veterinarians often provide complimentary examinations, routine care such as vaccinations and dewormings as well as spays and neuters, as these oft-overlooked procedures encourage responsible pet care. Emergency housing of farm animals and horses might also be required. 

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\* Based on *Bordetella bronchiseptica* challenge.  
1. Gore T, Headley M, Laris R, Bergman JGHE, et al. Intranasal kennel cough vaccine protecting dogs from experimental *Bordetella bronchiseptica* challenge within 72 hours. *The Veterinary Record*, 2005; 156:482-3  
2. Welborn LV, DeVries JG, Ford R, et al. 2011 AAHA Canine Vaccination Guidelines. *JAAHA*. Sept/Oct. 2011; 47:5. Available at: [https://www.aaha.org/public\\_documents/professionalguidelines/caninevaccineguidelines.pdf](https://www.aaha.org/public_documents/professionalguidelines/caninevaccineguidelines.pdf). Accessed November 24, 2016

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## WHY COMPLETE A PRACTICE OWNERS ECONOMIC SURVEY?

**CREDITS:** Darren Osborne, MA; Frank Richardson, DVM, MBA; Dr. Bob Bellamy, Chair, Practice Economics Committee, Saskatchewan Veterinary Medical Association.

### 1 IMPROVED FEE GUIDE

You get a better fee guide—using the information returned in the surveys, the CVMA can produce the provincial suggested fee guides, non-DVM wage reports, and the national economic report.

### 2 INDIVIDUAL PRACTICE DIAGNOSTIC REPORT

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### 3 FREE PRACTICE VALUE ESTIMATE

You get a free practice value estimate. Based on information from the practice owners economic survey and financial statements, the practice value estimate provides a practice value estimate based on cash flow. Presented as a gross revenue percentage, the practice value estimate incorporates revenue, expenses and veterinary production. Some veterinarians see the figure as an annual financial grade. If the practice value estimate has gone up, then the practice is in better shape than the previous year.

## BCVTA SURVEY RESULTS FOR BC VETERINARY TECHNOLOGISTS JOB SATISFACTION

When asked what our members considered an appropriate hourly wage for an RVT:

- 47 PER CENT: \$25–30
- 32 PER CENT: \$20–25
- 37 PER CENT: >\$30
- 3 PER CENT: <\$20

100 per cent responded that it should be based on experience and/or credentials.

For further information, please see the full report at [www.bcvta.com](http://www.bcvta.com).

### What did we find out?

- Over 50 per cent of respondents have been in their current job for less than five years and have been employed at fewer than three clinics.
- The majority of clinics in BC do NOT hire Non-Registered VTs (57 per cent) or on-the-job-trained techs (64 per cent).
- Only 31 per cent of employers lay out goals and incentives, and it is uncommon for employees to receive an exit interview when they leave. This is a missed opportunity for employers, as they could use this chance to make clinic improvements.
- Of those RVTs who completed the survey, 53 per cent earn \$20–\$25 an hour, 27 per cent earn less than \$20 an hour, and 19 per cent earn more than \$25 an hour.

### From the short-answer questions, we learned that:

- The top reasons employees leave are: low wages, long hours, poor management, feeling unappreciated, stress, and career change/maternity.
- The top reasons employees stay in their current position are: wages, benefits, team/staff, quality of medicine, and full utilization of their skills.
- What employees are looking for in a place of employment: positive working environment, quality medicine, respect (personal and skills), benefits, and wages.
- The incentives employees would like to see are: profit sharing/RRSPs, benefits including sick days, paid holidays, and subsidized childcare.
- For those who have left the field, the top reasons for leaving were: wages, work environment, maternity, school, and compassion fatigue.

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11 **Fast Ultrasound**  
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[www.scilvet.ca/scil-vet-academy/seminar-schedule/event/965/](http://www.scilvet.ca/scil-vet-academy/seminar-schedule/event/965/)

19-20 **International Meeting on Nutraceuticals**  
Singapore  
[www.meetingsint.com/pharma-conferences/nutraceuticals](http://www.meetingsint.com/pharma-conferences/nutraceuticals)

22-25 **International Conference on Communication in Veterinary Medicine**  
Hockley Valley Resort, ON  
[www.ovma.org/events/international-conference-on-communication-in-veterinary-medicine/](http://www.ovma.org/events/international-conference-on-communication-in-veterinary-medicine/)

APRIL

27-29 **Veterinary Wellness Workshop & Retreat**  
Banff, AB  
[www.criticalcarevet.ca/](http://www.criticalcarevet.ca/)

MAY

1-2 **Interdisciplinary Approaches to Managing Health of Fish and Wildlife**  
Kimberley, BC  
[www.cmiaa.org/event/interdisciplinary-approaches-to-managing-health-of-fish-and-wildlife/](http://www.cmiaa.org/event/interdisciplinary-approaches-to-managing-health-of-fish-and-wildlife/)

9 **Cardiology Seminar, with Meg Sleeper, VMD, BS, Dipl. ACVIM (Cardiology)**  
7:30 AM  
Sandman Hotel & Suites, Abbotsford, BC  
[www.eventbrite.ca/e/cvma-sbcv-chapter-spring-regional-ce-sessions-tickets-43638089701](http://www.eventbrite.ca/e/cvma-sbcv-chapter-spring-regional-ce-sessions-tickets-43638089701)

MAY

10 **Cardiology Seminar, with Meg Sleeper, VMD, BS, Dipl. ACVIM (Cardiology)**  
7:30 AM  
Best Western Dorchester Hotel, Nanaimo, BC  
[www.eventbrite.ca/e/cvma-sbcv-chapter-spring-regional-ce-sessions-tickets-43638089701](http://www.eventbrite.ca/e/cvma-sbcv-chapter-spring-regional-ce-sessions-tickets-43638089701)

17 **Surgery and Pain Management Seminar, with Chris Jordan, BSc (Hons), BVetMed, Dipl. ECVS, MRCVS, and Tara Edwards, DVM, Dipl. ACVSMR, CCRT, CVPP**  
7:30 AM  
Best Western Plus Kelowna Hotel & Suites, Kelowna, BC  
[www.eventbrite.ca/e/cvma-sbcv-chapter-spring-regional-ce-sessions-tickets-43638089701](http://www.eventbrite.ca/e/cvma-sbcv-chapter-spring-regional-ce-sessions-tickets-43638089701)

18-20 **3rd World Aquatic Veterinary Medical Association Conference & Biosecurity Workshop**  
St. Kitts, West Indies  
[www.worldvet.org/events.php?item=208&view=item](http://www.worldvet.org/events.php?item=208&view=item)

30 **Cat Healthy Seminar, with Margie Scherk, DVM, Dipl. ABVP (Feline Practice)**  
7:30 AM  
Hume Hotel, Nelson, BC  
[www.eventbrite.ca/e/cvma-sbcv-chapter-spring-regional-ce-sessions-tickets-43638089701](http://www.eventbrite.ca/e/cvma-sbcv-chapter-spring-regional-ce-sessions-tickets-43638089701)

JUNE

19-21 **UCVM Beef Cattle Conference**  
Calgary, AB  
[http://vet.ucalgary.ca/thesummit/?utm\\_source=veter.ucalgary.ca/beef&utm\\_medium=redirect&utm\\_campaign=redirect](http://vet.ucalgary.ca/thesummit/?utm_source=veter.ucalgary.ca/beef&utm_medium=redirect&utm_campaign=redirect)

22-23 **Ophthalmology in general practice**  
Vancouver, BC  
[www.ivseminars.com/seminars/registration/ophthalmology\\_in\\_general\\_practice\\_vancouver](http://www.ivseminars.com/seminars/registration/ophthalmology_in_general_practice_vancouver)

AS REPORTED IN THE MEDIA

BC RESEARCHERS ASK PUBLIC FOR HELP MONITORING DEADLY DISEASES:  
[www.cbc.ca/news/canada/british-columbia/wanted-dead-bats-b-c-researchers-ask-public-for-help-monitoring-deadly-disease-1.4493730](http://www.cbc.ca/news/canada/british-columbia/wanted-dead-bats-b-c-researchers-ask-public-for-help-monitoring-deadly-disease-1.4493730)

VETERINARIANS WARN PET OWNERS DOGS CAN GET THE FLU, TOO:  
[www.globalnews.ca/news/3974670/veterinarians-warning-pet-owners-their-dogs-can-get-the-flu-too/](http://www.globalnews.ca/news/3974670/veterinarians-warning-pet-owners-their-dogs-can-get-the-flu-too/)

THE BCSPCA CALLS FOR VETERINARIANS TO ENACT BAN ON DECLAWING CATS:  
[www.theprovince.com/news/local-news/b-c-sPCA-calls-for-veterinarians-to-enact-ban-on-declawing-cats/wcm/81e7f677-84b7-40eb-a7df-b7acdd1e9cc8](http://www.theprovince.com/news/local-news/b-c-sPCA-calls-for-veterinarians-to-enact-ban-on-declawing-cats/wcm/81e7f677-84b7-40eb-a7df-b7acdd1e9cc8)

BC VETERINARIANS ON ALERT AFTER DOG FLU SHOWS UP IN ONTARIO:  
<http://vancouver.sun.com/news/local-news/b-c-veterinarians-on-alert-after-dog-flu-shows-up-in-ontario>

POT DOG TREAT SPOOKS PET OWNER:  
[www.cbc.ca/news/canada/british-columbia/she-had-the-munchies-pot-dog-treat-spoons-pet-owner-1.4492126](http://www.cbc.ca/news/canada/british-columbia/she-had-the-munchies-pot-dog-treat-spoons-pet-owner-1.4492126)

VANCOUVER AQUARIUM BOWS TO PRESSURE TO BAN WHALES, DOLPHINS:  
<http://vancouver.sun.com/news/local-news/vancouver-aquarium-bows-to-pressure-to-ban-cetaceans>

DON'T FEED YOUR PET RAW MEAT FOODS—IT'S DANGEROUS FOR BOTH PETS AND HUMANS, EXPERTS WARN:  
[www.globalnews.ca/news/3961882/dont-feed-your-pet-raw-meat-foods-its-dangerous-for-both-pets-and-humans-experts-warn/](http://www.globalnews.ca/news/3961882/dont-feed-your-pet-raw-meat-foods-its-dangerous-for-both-pets-and-humans-experts-warn/)

FERRET RESOURCES ADDED TO VETLEXICON

Ferrets are the latest species to be added to Exotis, the exotic section of Vetstream's digital clinical reference service, Vetlexicon. In adding resources on ferrets, Vetstream aims to address a shortage of up-to-date clinical information on this species, a popular pet in many countries.

For more information [www.vetstream.com](http://www.vetstream.com)



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MARCO CERVI DVM, DACVS



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