Laparoscopic-assisted cystotomy for urolith removal in dogs and cats — 23 cases

The Ontario Veterinary College Hip Certification Program — Assessing inter- and intra-observer repeatability and comparison of findings to those of the Orthopedic Foundation for Animals

Nutritional and microbial analysis of bully sticks and survey of opinions about pet treats

Cerebellar granuloprival degeneration in an Australian kelpie and a Labrador retriever dog

Acute renal failure in 2 adult llamas after exposure to Oak trees (Quercus spp.)

Jugular thrombophlebitis in horses: A review of fibrinolysis, thrombus formation, and clinical management

Cholesterol granuloma associated with otitis media and leptomenigitis in a cat due to a Streptococcus canis infection

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Dear Editor,


I acknowledge the efforts of the authors in performing the study, but not the attempt to prove that their technique is superior to the standard hand-sewn 2 layers. I have several points I’d like the authors to explain.

First, I have some questions about luminal measurements. The authors use Figure 1 to support their findings. Figures 1a and 1b supposedly depict the same colon before and after the enterotomy. By looking at these pictures, the shape of the colon is evidently different and the measurements can vary widely depending on which part is selected as the measuring spot. Furthermore, when the authors state that they take 3 measurements for each colon, they don’t provide indications as to the specific point (for example, at one side, in the middle of the enterotomy) where said measurements are taken, and Figure 1e is no help at all in understanding this.

Even more curious is how they managed to perform the measurements at the same spot before and after the enterotomy without the prior placement of a marker. In Figure 1b one can clearly see that the distal part of the enterotomy causes a stenosis of the pelvic flexure, so I would imagine that measurements taken at that point would be affected. In Figure 1e there are 3 spots marked for measuring, but I cannot see how they can be correlated to the measurements marked in Figure 1f.

It is not clear if all measurements were taken on X-rays as in Figures 1a through 1e or as in Figure 1f. In case of the former, then again Figures 1a and 1b show the same colon with different shapes, making it difficult to understand how the measurements were comparable. In case of the latter, the authors should explain how they can be sure to remeasure the same spots as in Figure 1e without interference from the superimposition of other parts of the pelvic flexure that were not involved in the enterotomy.

Second, I have some questions about bursting pressure testing. The authors used a manometer with a maximum value of 120 cm H2O, or 88.27 mmHg. They found that 4 out of 7 hand-sewn and 4 out of 6 stapled enterotomies burst when subjected to pressure exceeding 120 cm H2O, and therefore concluded that there is no statistically significant difference in bursting pressure between the 2 techniques. But previous studies suggest that techniques involving stapling instruments have a very low bursting pressure, particularly when using everting patterns, while 2-layer hand-sewn techniques have a bursting pressure that is similar to that of an intact bowel.

The result might have been impaired by the limited scale of the manometer. If, for example, they had employed a manometer with a maximum pressure over 200 mmHg (272 cm H2O, more than twice the maximum value of the device they used), they might have found that stapled techniques burst a little over 120 cm H2O, while hand-sewn techniques burst at a much higher pressure, thus witnessing a statistically significant difference.

I would also like to address another concern. The authors state that they observed a significant difference between the percentages of luminal reduction and say that this is due to the fact that a 2-layer hand-sewn technique features a second over-sewn layer that causes constriction. Let us consider how this suture pattern is performed. The first full-thickness layer is sutured by apposition, yielding a minimal use of tissue that can be estimated for example at 6 mm. The second layer (that is, Cushing’s) should be performed with insertions at a distance of 3 to 5 mm from the edge of the wound, thus causing a tissue use of 6–10 mm. Total tissue consumption, therefore, ranges from 12 to 16 mm, 20 mm if we hypothesize that it could have been performed by a resident. The TA90 staplers that the authors use in their study features jaws 7 mm (8 mm for the anvil) thick. Apposing the 2 edges of the enterotomy in these jaws will cause a minimum tissue usage of 14 mm, or much more if we consider that the surgical procedure described by the authors suggests the placement of a line of Allis forceps to hold the tissue in place before firing the stapler.

I, therefore, cannot see how these techniques can produce such a difference in luminal stenosis, particularly if we take into account what has been previously said about the measurement spots for lumbar stricture.

Although briefly explained in another paper on the same subject, the authors don’t consider that 6 cm could be a short length for most enterotomies and that a longer incision might be necessary, therefore requiring 2 stapler cartridges. I wonder if in this case the time difference would still be statistically significant.

Marco Gandini, DMV, PhD  
Clinica Chirurgica Veterinaria  
Dipartimento di Patologia Animale  
Facoltà di Medicina Veterinaria di Torino  
Grugliasco, Torino, Italia.
The ethical question on prolonging the life of a cancer patient — A comment

Dear Editor,

We read the August 2012 ethical question of the month (Can Vet J 2012;53:823) and the subsequent comment in the November 2012 issue (Can Vet J 2012;53:1154–1155), and frankly, were disappointed by the scenario presented by Dr. Rollin. The proposed treatment plan was, in our opinion, unrealistic. Most, if not all, veterinary oncologists would not have recommended the aggressive treatment options offered in this case. Thus, this ethical question to the family veterinarian does not represent an ethical dilemma for oncologists, as the advice we would give would not have allowed this situation to occur in the first place. This was our main reason for not responding in August. However, we felt compelled to respond following certain comments published in the November issue of The CVJ.

We would like to address a few points in response to Dr. Goeree’s comments. Firstly, we believe that the decision about your patient’s care has everything to do with you, the family veterinarian. As a freethinking individual, you are allowed to formulate your own opinion that can be shared with your client and the open-minded specialist. Communication is a key component between the professionals involved in the patient’s health care needs and, obviously, the client. Why would you just “defer, nod, and bob”? The family veterinarian is a critical player in this scenario — your client is looking to you for your trusted opinion as they know you best and value your insight.

Dr. Goeree made the following statement: “The only players are the oncologists who believe in clinical care heedless of (all aspects of) cost and the owners, who are in denial of death and reality.” A considerable amount of time is taken with every client during an oncology consultation, and a crucial point discussed with all clients is the fundamental importance of quality of life — the primary goal when treating cancer-bearing pets. It is typically the oncologist who educates the owner about the reality of the situation by providing evidence-based information, and not providing false hope. Appropriately educating the owners helps them make clear, conscious, and informed decisions and, in fact, helps avoid denial of death and reality. Cost always remains an important factor, and suggesting that oncologists pursue treatment “heedless of cost” is both unfair and inaccurate.

We do not have the tendency to “pat ourselves on the back for our Godly interventions and self-ascribed compassion.” If Dr. Goeree is against treating cancer-bearing pets, even in situations where the patient could potentially be cured, then he should state so. It seems like everything we do in veterinary medicine could be considered a “Godly intervention,” including the administration of insulin to the diabetic cat or furosemide to the dog with congestive heart failure. Even surgeries such as spay, castration, and fracture repairs are imposed on animals. None of our patients sign their own informed consent forms.

We agree with most of Dr. Rollin’s interpretation of this scenario with the exception of a few details. In some cases, short-term discomfort may be considered worthwhile if it means cure or long-term control of the tumor with excellent quality of life ensuing. Chemotherapy in cancer-bearing pets generally is not “extremely unpleasant” as it sometimes is in humans — if it were, we would not recommend it. In this case scenario, however, the dog was presented with pulmonary metastases and the proposed plan that included thoracotomy and splenectomy was simply unreasonable. We can only agree that pursuing these options is not a way to demonstrate love to your companion and we would not recommend it if that situation arose in our practices.

We considered it important to write this letter because some practitioners might erroneously conclude that the proposed scenario reflects how certain oncologists think. Fortunately, the reality differs.

Valerie MacDonald, DVM, Dipl. ACVIM (Oncology)
Associate Professor, Department of Small Animal Clinical Sciences
Western College of Veterinary Medicine
Saskatoon, Saskatchewan

Louis-Philippe de Lorimier, DMV, Dipl. ACVIM (Oncology)
Staff Medical Oncologist
Hôpital Vétérinaire Rive-Sud
Brossard, Québec

Marie-Ève Nadeau, DMV, Dipl. ACVIM (Oncology)
Professeur agrégée
Faculté de médecine vétérinaire — Département des Sciences Cliniques
Université de Montréal
St-Hyacinthe, Québec

Monique Mayer, DVM, Dipl. ACVR (Radiation Oncology)
Associate Professor, Department of Small Animal Clinical Sciences
Western College of Veterinary Medicine
Saskatoon, Saskatchewan
itch, scratch, lick, itch, scratch...

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Dear Editor,

“Where the bulls rage, the grass suffers.”

In human relations, triangulation rarely achieves a happy end. Only with extreme caution should a practitioner enter the ring where the twin bulls of owner desperation and specialist agendas are raging. If the practitioner cannot scream with enthusiastic vigour at the bull fight, then avoiding the arena (the nod-n-bob option) is the only civilized alternative. Triangulation, as suggested by the writers, would merely damage the grass even more.

The ending of this situation is preordained — the dog dies soon. The choices we make determine how much parched earth is left behind.

Gerald (Gary) Goeree, DVM, MSc, Kitchener, Ontario

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The ethical question on prolonging the life of a cancer patient — A reply

Dear Editor,

Although the letter from MacDonald et al. is primarily directed at Dr. Goeree, I would be remiss if I failed to correct a number of errors therein. In the first place, the letter affirms that the case in question is “a scenario presented by Dr. Rollin.” That is simply wrong. I never create the cases that are discussed in the ethics column. They are always sent in by veterinarians who encountered them. This in itself shows that the case is not the straw man that the letter-writers suggest it is, when they explain that “we considered it important to write this letter because some practitioners might erroneously conclude that the proposed scenario reflects how certain oncologists think. Fortunately, the reality differs.”

If the writers of the letter are simply going on record to affirm that they would never recommend the regimen described, that is laudable, and very likely true, but tells us nothing about what other oncologists do. The case itself shows otherwise, since the regimen was suggested by a referring clinician; most likely an oncologist, although we are not told explicitly. From my own experience with oncologists, I know that, like any other set of humans, they run the gamut from those who would never suggest such a regimen to those who regularly do.

Similarly, some oncologists discuss quality of life, others don’t, rather emphasizing potential for “cure.” But the most egregious error in this letter is the claim that “Chemotherapy in cancer-bearing pets generally is not “extremely unpleasant” as it sometimes is in humans. If it were, we would not recommend it.” This is profoundly disingenuous. Chemotherapy is, in the end, selective poisoning, which by its very nature can and does produce major and severe “side effects.” I have observed countless trials in animals to determine the nature of these effects, sometimes in order to extrapolate drug effects to humans. If the authors really stand behind the foregoing statement, I have a bridge to sell them in Brooklyn!

Bernard E. Rollin
University Distinguished Professor
Professor of Philosophy
Professor of Animal Sciences
Professor of Biomedical Sciences
University Bioethicist

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The ethical question on prolonging the life of a cancer patient — A reply
President’s Message  
Mot du président

A Perfect Storm?  
Une tempête parfaite?

Though Superstorm Sandy and its sidekick the Nor’easter seem a distant memory in 2013, the weather system devastated parts of the Northeastern United States and Canada. Our thoughts go out to all of the people and animals that were displaced by the disaster. We hope that their situations have improved and life is closer to normal. We salute all those involved in the animal rescues and hope for a quieter new year.

As we head into 2013 it is evident that there are many issues facing veterinary medicine in the near and far future. As I travel around the country and listen to veterinarians in various parts of Canada, I wonder if we are at the cusp of a “perfect storm.” Consider, for example, what I believe to be the top 5 issues facing veterinary medicine in Canada today.

Number 1: Stagnation of veterinary practice growth. This condition was recognized in the United States much earlier than in Canada — but the issue is certainly being discussed and debated in this country now as well. The term I heard for this last weekend was “the new growth in gross revenue is simply staying at status quo and not falling behind.” There is now (and always has been) more to practice viability than growth with a plethora of tools to aid in overall veterinary practice health. Discussion is ongoing around several objectives to help “turn things around.” These include developing programs to drive more of the pet-owning public to veterinary care, creating wellness programs, and advocating more effective use of social media and the internet with respect to both provision of information and addressing drug supply issues.

Number 2: Supply of veterinarians. There has been much written on this subject. If we look back in history most articles pointed to undersupply of veterinarians. This is especially true of the food animal sector. Currently, there is some discussion that undersupply may not be the correct term. The problem may be decreased animal numbers in rural areas creating a lack of economic viability for veterinarians to service these areas. This is an incredibly complex subject; one that will continue to foster further analysis and discussion. With the demand for veterinary

Même si la super-tempête Sandy et la tempête qui a suivi semblent un souvenir lointain en 2013, le système météorologique a dévasté des régions du Nord-Est des États-Unis et du Canada. Nos pensées sont avec les personnes et les animaux qui ont été déplacés par la catastrophe. Nous espérons que leur situation s’est améliorée et que la vie retourne à la normale. Nous saluons toutes les personnes qui ont participé au sauvetage d’animaux et nous espérons que la nouvelle année sera plus calme.

Tandis que nous entamons 2013, il semble évident que la médecine vétérinaire doit relever de nombreux défis dans un avenir rapproché et lointain. Tandis que je parcours le pays et que j’écoute les vétérinaires dans diverses régions, je me demande si nous ne sommes pas au bord d’une «tempête parfaite». Par exemple, considérons ce qui, selon moi, sont les cinq défis les plus pressants que doit relever la médecine vétérinaire canadienne d’aujourd’hui.

N° 1 : La stagnation de la croissance de la pratique vétérinaire. Cette situation a été reconnue aux États-Unis bien avant qu’elle ne soit identifiée au Canada — mais la question fait aussi certainement l’objet de discussions et de débats à l’heure actuelle dans ce pays. La fin de semaine dernière, le terme que j’ai entendu pour décrire cette situation était «la nouvelle croissance du chiffre d’affaires consiste à maintenir le statu quo et à ne pas afficher de recul». La viabilité s’appuie maintenant sur plus que la croissance à l’aide d’une panoplie d’outils (ce qui a toujours été le cas) pour faciliter la santé globale de la pratique vétérinaire. Des discussions sont en cours à propos de plusieurs objectifs visant à faciliter «un renversement de la vapeur», notamment l’élaboration de programmes pour attirer un plus grand nombre de propriétaires d’animaux dans les cliniques vétérinaires, la création de programmes de bien-être et la promotion d’une meilleure utilisation des médias sociaux et de l’Internet en ce qui a trait à la transmission de l’information et à la résolution du problème de l’approvisionnement de médicaments.

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education still strong, academic institutions are continuing to increase supply. Have we reached the point of oversupply? Veterinary education is broad, which leads to an incredible number of opportunities beyond traditional practice roles. We must continue to look at the core competencies of graduating veterinarians and how new veterinarians can take advantage of all the opportunities available. Is it time for further differentiation in education delivery?

Number 3: New competitive pressures. There are many and varied pressures including “Dr. Google.” New non-traditional methods of veterinary care delivery continue to impact on the way veterinary medicine is “practised.” The commoditization of many aspects of veterinary medicine forces us to look at new and innovative methods of service delivery including those mentioned in my first concern. One of the new “buzz words” is that we must move beyond the “service economy” into the “experience economy” (1) and give clients an experience that they will remember and for which they will pay. In food animal veterinary practice, changes in veterinary care delivery has become a topic of increased discussion. Traditional individual animal medicine is still important but does not fit as well with large herd and flock management. Consulting practice goes so far but still does not tie the veterinarian directly to a specific farm. In some instances we must move to an integrated model wherein our services and fees are integrated with production.

Number 4: “Disjointed” veterinary practice. While practising I considered myself a “James Herriot” style veterinarian as I was exposed to and worked in a diverse veterinary medical environment. Specialization is great for veterinary medicine and provides many more opportunities for consultation, treatment and surgery. What we don’t want to leave behind is the “family” or herd veterinarian who is available as the point person and has the broad knowledge of the patient or farm, and the ability to “put everything together.” Veterinarians must continue to promote themselves as point people and as guardians of their clients’ animals’ health.

Number 5, and my last concern, is the continued issue surrounding the viability of veterinary self-regulation. Currently in all 10 provinces, the public has put its trust in the regulation of veterinary medicine with our peers. In some instances this can be costly and we sometimes wonder if this is the best way to go. I would maintain that we must continue to guard that which the public has entrusted to us. What better way to be judged than by your peers.

A perfect storm? I would suggest we have a perfect opportunity! As a small profession we must continue to ensure we act professionally and continue to strive to better our profession by mitigating all of these concerns. Developing the tools to tackle these issues can only happen with national coordination. What better way to do this than to do this as “one voice and one profession.”

Jim Fairles
President, Canadian Veterinary Medical Association

Reference

No 2: Offre de vétérinaires. Beaucoup d’encre a coulé sur ce sujet. Si nous consultons des articles antérieurs, la plupart signalent une pénurie de vétérinaires. Cela est particulièrement vrai dans le secteur des animaux destinés à l’alimentation. À l’heure actuelle, l’emploi du terme «pénurie» fait l’objet de discussions quant à son exactitude. Le problème pourrait être le nombre réduit d’animaux dans les régions rurales qui entrave la viabilité financière des vétérinaires desservant ces régions. Il s’agit d’un sujet incroyablement complexe que nous continuerons d’analyser et de discuter. Vu que la demande pour l’enseignement vétérinaire est toujours forte, les établissements d’enseignement continuent d’accroître l’offre de vétérinaires. Possédons-nous maintenant un surplus de vétérinaires? La formation vétérinaire est vaste, ce qui ouvre un nombre incroyable de possibilités au-delà des rôles d’une pratique traditionnelle. Nous devons continuer d’examiner les compétences fondamentales des vétérinaires finissants et la façon dont les nouveaux vétérinaires peuvent se prévaloir des occasions offertes. Est-il temps d’établir de nouvelles différenciations dans la présentation de l’enseignement?

No 3 : Nouvelles pressions concurrentielles. Il y a des pressions nombreuses et variées, incluant le «D’ Google». De nouvelles méthodes non traditionnelles de prestation des soins vétérinaires continuent d’avoir un impact sur la façon dont la médecine vétérinaire est «exercée». La banalisation de nombreux aspects de la médecine vétérinaire nous force à envisager des méthodes nouvelles et innovatrices de prestation de services, incluant celles mentionnées dans la première préoccupation que j’ai signalée précédemment. L’un des concepts à la mode veut que l’on passe d’une «économie de services» à une «économie de l’expérience» (1) et que l’on donne aux clients une expérience dont ils se souviendront et pour laquelle ils seront prêts à payer. En pratique vétérinaire des animaux destinés à l’alimentation, les changements dans la prestation des soins vétérinaires font maintenant l’objet de discussions fréquentes. La médecine traditionnelle pour les animaux individuels est toujours importante, mais elle ne convient pas toujours à la gestion d’un grand troupeau. Les pratiques de consultation facilitent la situation mais n’établissent toujours pas un lien direct entre le vétérinaire et une ferme particulière. Dans certains cas, nous devons adopter un modèle intégré où nos services et nos honoraires sont intégrés à la production.

No 4 : Pratique vétérinaire dites «décousues». Lorsque j’exerçais la médecine vétérinaire, je me considérais comme un vétérinaire à la James Herriot, car j’exerçais dans un environnement de médecine vétérinaire diversifiée. La spécialisation est excellente pour la médecine vétérinaire et offre de nombreuses possibilités nouvelles pour la consultation, le traitement et la chirurgie. Nous ne voulons toutefois pas abandonner le vétérinaire «de famille» ou de troupeau qui est la personne-ressource présente possédant une vaste connaissance du patient ou de la ferme capable de «réunir les morceaux du casse-tête». Les vétérinaires doivent continuer à se présenter comme les personnes-ressources et les gardiens de la santé des animaux de leurs clients.

No 5 : Enfin, ma dernière préoccupation est la question persistante entourant la viabilité de l’autoréglementation des
vétérinaires. Actuellement, dans les dix provinces, le public fait confiance à la réglementation de la médecine vétérinaire avec nos pairs. Dans certains cas, cela peut être coûteux et nous nous interrogeons parfois sur la validité de cette approche. J’estime que nous devons continuer de protéger ce que le public nous a confié. Quoi de mieux que d’être jugé par nos pairs?

Une tempête parfaite? Je suggère qu’il s’agit d’une occasion parfaite! À titre de profession avec un faible nombre de membres, nous devons continuer d’agir de manière professionnelle et de nous efforcer à mieux desservir notre profession en atténuant ces préoccupations. L’élaboration d’outils pour aborder ces enjeux peut seulement se produire à l’aide d’une coordination nationale. Quoi de mieux que de mettre cette stratégie en œuvre sous la bannière d’une voix et une profession? 

Jim Fairles  
Président de l’Association canadienne des médecins vétérinaires

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Ethical question of the month — January 2013

You have been out several times to treat newly placed calves in a feedlot belonging to a longtime client of yours. You noticed on your first visit that the old farm dog was moving slowly and appeared a bit "rougher" than when you were last at the feedlot a year ago. You mention this in passing to the owner who agrees that the dog is getting on in years. At subsequent visits it becomes obvious the dog is deteriorating, although reportedly eating normally. You offer to take the dog back to the clinic for an examination and workup, but the owner declines. You gently make the point that the dog may be reaching a point where it is no longer enjoying itself. The owner assures you he knows when it is time to put a dog down and he will handle it himself. You suspect the dog will not be put down until it is too weak to stand. Is there a problem with this approach in an aged companion animal?

Responses to the case presented are welcome. Please limit your reply to approximately 50 words and forward along with your name and address to: Ethical Choices, c/o Dr. Tim Blackwell, Veterinary Science, Ontario Ministry of Agriculture, Food and Rural Affairs, 6484 Wellington Road 7, Unit 10, Elora, Ontario N0B 1S0; telephone: (519) 846-3413; fax: (519) 846-8178; e-mail: tim.blackwell@ontario.ca

Suggested ethical questions of the month are also welcome! All ethical questions or scenarios in the ethics column are based on actual events, which are changed, including names, locations, species, etc., to protect the confidentiality of the parties involved.

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Ethical question of the month – October 2012
You have worked in an upscale, urban veterinary clinic since graduation 2 years ago. You enjoy the high quality of veterinary medicine that is standard practice at this clinic. An elderly client of yours on a fixed income is visually impaired and depends on a 4-year-old Labrador retriever service dog to get around. The dog is admitted to your clinic after being hit by a car. It is stable, but radiographs reveal an oblique midshaft fracture of the femur. The estimate to plate the fracture (the only repair offered) is $4400.00. The dog is uninsured and the owner cannot afford the cost, but will receive a replacement dog at no cost at some time in the future. You discuss this case with a classmate who works across town in another practice. She tells you that they use intra-medullary pins with or without circlage wire to repair such fractures for less than half of your quote, with a very high success rate. She also says they maintain a fund at the clinic to offset the cost in cases such as this. You mention this to your employer who unequivocally forbids you to refer this dog to a competing practice. You offer to do the surgery yourself during your free time at no cost but your employer refuses you permission. Nor will he discount the fee or provide for a payment plan as he feels this would set a precedent in future cases. How should you respond?

Submitted by Dr. Roy Lewis, Westlock, Alberta

Question de déontologie du mois – Octobre 2012
Vous travaillez dans une clinique vétérinaire urbaine de haut calibre depuis l’obtention de votre diplôme il y a deux ans. Vous appréciez la grande qualité des soins vétérinaires qui sont offerts à cette clinique. Un de vos clients âgés malvoyants gagne un revenu fixe et dépend d’un Labrador retriever d’assistance âgé de quatre ans pour se déplacer. Le chien est admis à votre clinique après avoir été heurté par une automobile. Son état est stable, mais les radiographies révèlent une fracture médiane oblique du fémur. L’estimation pour réparer la fracture à l’aide d’une plaque (la seule réparation offerte) est de 4400 $. Le chien n’est pas assuré et le propriétaire n’a pas les moyens de payer la facture, mais il recevra gratuitement un chien de remplacement à une date ultérieure indéterminée. Vous discutez ce cas avec une consoeur de classe qui travaille dans une pratique située de l’autre côté de la ville. Elle vous dit que sa pratique utilise des broches intramédullaires avec ou sans fil de circlage osseux pour réparer de telles fractures, une intervention qui coûte la moitié de votre estimation et présente un taux de succès très élevé. Elle dit aussi que la clinique possède un fonds d’aide pour des cas comme celui-ci. Vous mentionnez cela à votre employeur qui vous interdit formellement de recommander ce chien à une pratique concurrente. Vous offrez de faire vous-même la chirurgie sans frais dans vos temps libres, mais votre employeur refuse de vous donner la permission. Il refuse aussi d’offrir une réduction du tarif et d’échelonner les paiements, car il estime que cela établirait un précédent. Comment devriez-vous répondre?

Soumise par le Dr Roy Lewis, Westlock (Alberta)

An ethicist’s commentary on the case of a service dog needing fracture fixation
Readers of this column may recall a horrible incident in California, where a sadistic maniac tampered with eyedrops being sold over the counter, and inserted acid into the bottles. One of my friends was one of the first victims of this psychopath, and tragically lost sight in both eyes. She told me many years after her eyes had been irrevocably burned that she had seriously contemplated suicide shortly thereafter. What redeemed her situation, allowing her to resume a relatively normal, productive life was the acquisition of her seeing eye dog, whom she credited with “giving me back my life.”

As the above anecdote attests, people who are blinded develop a uniquely powerful bond with the animals upon whom they depend. Since the dog in this case is only 4 years old, the potential for significant prolongation of their relationship is blocked only by the owner’s inability to pay for the requisite procedure on the dog’s leg. You, the veterinarian, fully recognize the incredible bond between owner and animal. On the other hand, the practice owner for whom you work is myopic to an extreme, blinded by greed. Were this not the case, he or she would readily understand the enormous potential for positive public relations for the practice implicit in restoring the animal to functional health. One cannot buy that sort of good publicity for any amount of money. By the same token, one cannot undo the devastating negative publicity that would ensue were the public to become aware of the practice owner’s refusal to help. I would, therefore, begin by making that point forcefully to my employer. If he is a reasonable person, he or she will readily see the advantage of treating the dog, and indeed doing so utilizing Cadillac medicine.

My good friend, legendary small animal practitioner Brian Forsgren, often challenges audiences of veterinary students with the question of whether rich people value their animals more than do the indigent. Students invariably answer in the negative, a point Dr. Forsgren has repeatedly seen confirmed in his ghetto practice. He has, in fact, made it his life’s work to serve such clients.

Were I the practitioner in this case, I would draw a line in the sand with my employer. I would stress the public relations dimension of the situation, and assure him or her of the potential value to the practice. More importantly, I would emphasize...
the moral dimension of the case, as well as my deep commitment to saving the priceless relationship between the dog and the owner. In as nice a manner as possible, I would make the point that what I do on my own time is my own business. If the owner values you as an employee, he or she should relent, and perhaps demand that you disassociate your actions from your role as his or her employee, though your employer would be plainly stupid to do so. The point is that this situation is clearly not the last time your values clash with those of the employer, and you might as well orchestrate a showdown relatively early in your history of employment. If your employer is deaf to your concerns and moral values, you might as well end your relationship at this point, though a smart employer would applaud your moral stance.

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1. How long, from the time of the first breeding, does gestation normally last in the bitch?
   a. 62 to 64 days
   b. 70 to 75 days
   c. 58 to 62 days
   d. 62 to 68 days
   e. 58 to 72 days

2. You review the radiograph of a dog’s fractured tibia. The cortex on one side of the bone is broken, and the other is bent. This fracture is appropriately classified as a:
   a. fissure fracture
   b. greenstick fracture
   c. physeal fracture
   d. comminuted fracture
   e. compacted fracture

3. If a squamous-cell carcinoma involves the middle segment of the mandible but has not metastasized to the lungs or lymph nodes, what is the most appropriate surgical procedure to decrease the chance of tumor recurrence?
   a. bilateral rostral mandibulectomy
   b. hemimandibulectomy
   c. segmental mandibulectomy with a cortical bone graft
   d. complete mandibulectomy
   e. excision of the mass, limited to soft tissue structures overlying the hemimandible

4. Concerning diabetes mellitus in cats, which statement is most accurate?
   a. Diabetes mellitus is most prevalent in female cats.
   b. Diabetic ketoacidosis does not occur in cats.
   c. Diabetic cats always require daily insulin injections to maintain normoglycemia.
   d. Insulin injections in cats typically have a longer duration of action than in dogs.
   e. Cats do not develop diabetic cataracts.

5. A 3-month-old Arabian filly is presented to your hospital for evaluation of recent onset of stertorous breathing and dysphagia. The foal appears to be generally healthy. You observe a nonpainful distension of the left parotid region. The owner tells you that the parotid swelling has been present since the foal was very young and now seems to be more noticeable. Radiographs of the foal’s head exhibit air-density distension of the left guttural pouch.

   Based on the history, clinical signs, and radiographs, what is the most likely diagnosis?
   a. guttural pouch tympany
   b. guttural pouch empyema
   c. guttural pouch mycosis

1. En comptant à partir du premier accouplement, quelle est la durée normale de la gestation chez la chienne?
   a. 62 à 64 jours;
   b. 70 à 75 jours;
   c. 58 à 62 jours;
   d. 62 à 68 jours;
   e. 58 à 72 jours.

2. Vous examinez la radiographie d’un tibia fracturé chez un chien. D’un côté de l’os, le cortex est fracturé alors que de l’autre, il est courbé. Cette fracture est adéquatement classée comme étant une :
   a. fêlure;
   b. fracture en bois vert;
   c. fracture de la plaque de croissance;
   d. fracture comminutive;
   e. fracture compacte.

3. Si un carcinome spino-cellulaire implique le segment moyen de la mandibule mais qu’il n’a pas métastasé aux poumons ni aux nœuds lymphatiques, quelle est l’intervention chirurgicale la plus appropriée pour diminuer les risques de résidus de la tumeur?
   a. mandibulectomie rostrale bilatérale;
   b. hémimandibulectomie;
   c. mandibulectomie segmentaire avec greffe osseuse corticale;
   d. mandibulectomie complète;
   e. excision de la masse limitée aux tissus mous recouvrant l’hémimandible.

4. À propos du diabète sucré chez le chat, lequel des énoncés suivants est le plus juste?
   a. Le diabète sucré est plus répandu chez les chattes.
   b. La céto-acidose diabétique n’affecte pas les chats.
   c. Les chats diabétiques exigent des injections d’insuline quotidiennes pour maintenir une glycémie normale.
   d. Chez les chats, les injections d’insuline possèdent de façon caractéristique une durée d’action plus longue que chez les chiens.
   e. Les chats ne souffrent pas de cataractes diabétiques.

5. Vous examinez à votre clinique une pouliche Arabe âgée de 3 mois, à cause de l’apparition récente de respiration stertoreuse et de dysphagie. L’animal semble de façon générale en santé. Vous observez une distension de la région parotidienne gauche. Le propriétaire vous mentionne que l’enflure de la parotide est présente depuis que la pouliche est toute jeune et que présentement elle est plus apparente. Les radiographies de la tête démontrent une distension aérogène de la poche gutturale gauche. À la
6. What is the most appropriate treatment for the foal described in 5 above?
   a. euthanasia
   b. antibiotics
   c. anti-inflammatories
   d. tracheostomy
   e. median septum fenestration

7. With respect to transmission, an important difference between coccidiosis and cryptosporidiosis in calves is that:
   a. Cryptosporidium requires an intermediate host
   b. coccidia affect calves as young as 1 week of age
   c. Cryptosporidium affects calves as young as 1 week of age
   d. Cryptosporidium does not infect calves under 3 weeks of age
   e. coccidia do not infect calves under 3 weeks of age

8. Which clinicopathologic assay is NOT helpful in confirming suspected liver disease in cattle?
   a. serum bilirubin concentration
   b. serum sorbitol dehydrogenase activity
   c. serum aspartate aminotransferase activity
   d. serum gamma-glutamyltransferase activity
   e. serum alanine aminotransferase activity

9. Anesthetic induction with propofol causes:
   a. bradycardia
   b. increased intracranial pressure
   c. hypotension in hypovolemic patients
   d. hypertension in normovolemic patients
   e. decreased cardiac output from myocardial depression

10. An abundance of eosinophils on a peripheral blood smear is most commonly associated with:
   a. neoplastic disease
   b. infection
   c. trauma
   d. allergic conditions
   e. stress

   (See p. 71 for answers./Voir les réponses à la page 71.)
2013 CVMA Awards
Last Call! Nominations Close January 31, 2013

Each year, through CVMA’s national veterinary awards program, veterinarians are honored for their exceptional contributions to veterinary medicine. All CVMA members are encouraged to nominate deserving colleagues for their hard work and dedication to the profession.

CVMA Awards will be presented during the CVMA Convention, which takes place in Victoria, British Columbia, from July 10–13, 2013. Nominations will be accepted until January 31, 2013 for the following awards:

- **CVMA Humane Award** *(Sponsored by Merck Animal Health)*
- **Merck Veterinary Award** *(Sponsored by Merck Animal Health)*
- **Small Animal Practitioner Award** *(Sponsored by Petsecure Pet Health Insurance)*
- **CVMA Industry Award**
- **CVMA Life Membership**
- **CVMA Honorary Membership**
- **NEW! CVMA Practice of the Year Award**

**NEW! CVMA Practice of the Year Award**

This year, the CVMA has introduced a new award to recognize a veterinary practice team for outstanding achievement within their local community. The CVMA Practice of the Year Award was established by the CVMA to recognize such achievements as innovations in the provision of veterinary services, commitment to work-life balance, meaningful community or charitable involvement, or implementation of “green” practice procedures.

To be considered, candidates must be nominated by a CVMA member, and the candidate must also be a CVMA member. Nomination packages must include a completed nomination form, a written description of the nominee’s work and supporting documents.

Nomination packages should be submitted by **January 31, 2013** via e-mail (tfrye@cvma-acmv.org) by fax 613-236-9681, or by mail to the CVMA office 339 Booth Street, Ottawa, ON K1R 7K1.

For additional information, including full descriptions of each award, nomination forms, and a listing of past award recipients, please visit the CVMA Web site (www.canadianveterinarians.net).

Prix de l’ACMV 2013
Dernier avis! Clôture des mises en candidature le 31 janvier 2013

Chaque année, dans le cadre du programme des prix vétérinaires nationaux de l’ACMV, des vétérinaires sont honorés pour leurs contributions exceptionnelles à la médecine vétérinaire. Nous encourageons tous les membres de l’ACMV à mettre en candidature des collègues méritants pour leur travail ardu et leur dévouement envers la profession.

Les prix de l’ACMV seront présentés durant le congrès de l’ACMV, qui déroulera du 10 au 13 juillet 2013 à Victoria (Colombie-Britannique). Les mises en candidature seront acceptées jusqu’au **31 janvier 2013** pour les prix suivants :

- **Prix humanitaire de l’ACMV** *(Commandité par Merck Santé animale)*
- **Prix vétérinaire Merck** *(Commandité par Merck Santé animale)*
- **Prix du praticien des petits animaux** *(Commandité par Petsecure assurance maladie pour animaux)*
- **Prix de l’industrie de l’ACMV**
- **Membre à vie de l’ACMV**
- **Membre honoraire de l’ACMV**
- **NOUVEAU* Prix de la pratique de l’année de l’ACMV**

**NOUVEAU! Prix de la pratique de l’année de l’ACMV**

Cette année, l’ACMV a introduit un nouveau prix afin de reconnaître une pratique vétérinaire pour des réalisations exceptionnelles au sein de sa collectivité locale. Le Prix de la pratique de l’année de l’ACMV a été établi par l’ACMV afin de reconnaître l’équipe d’une pratique vétérinaire pour des réalisations exceptionnelles comme l’innovation dans la prestation de services vétérinaires, l’engagement envers l’équilibre travail-vie, une participation communautaire ou du travail de bienfaisance ou encore la mise en œuvre de protocoles écoresponsables pour la pratique.

Pour être considérés, les candidats doivent être mis en candidature par un membre de l’ACMV et le candidat doit aussi être membre de l’ACMV. Les troupes de mise en candidature doivent inclure un formulaire rempli, une description écrite du travail du candidat et des pièces justificatives à l’appui.

Les troupes de mises en candidature doivent être soumises d’ici le **31 janvier 2013** par courriel (tfrye@cvma-acmv.org), par télécopieur au 613-236-9681 ou par la poste au bureau de l’ACMV, au 339, rue Booth, Ottawa (Ontario) K1R 7K1.

Pour obtenir des renseignements additionnels, incluant les descriptions complètes de chaque prix, les formulaires de mise en candidature et une liste des lauréats des années précédentes, veuillez visiter le site Web de l’ACMV (www.veterinairesaucanada.net).
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- Key Performance Indicators (KPI’s): Tools to Manage your Practice
- Managing Your Two Major Expenses: People and Professional Services
- Internal Controls: Trust is Not Enough
- Veterinary Practice Profit Tree

Karn Nichols
- Creating Awareness in Your Team: Driving Productivity
- On-boarding New Employees: Building a Practice Foundation

Wet Labs

Veterinarians: Full Day
Dr David Wlikie
- Eyelid, Adnexal and Corneal Surgery

Technicians: ½ Day
Dr Gary Conboy and Nicole Murphy
- Parasitology - Species in the Feces

Support Staff

Bash Halow
- Effective Communication
- Reducing Intra-office Bickering and Conflict

Dr Jayne Takahashi
- Managing Challenging Situations
- Presenting Value
- Pet Loss - Skills That Will Help our Clients (and Ourselves)

Dr Doreen Houston
- Things that are Poisonous to Your Pet: Common Things You Carry That Can Cause Harm
- Get With the Program: Six Steps to Weight Loss

Fees

Veterinarians
- Full $350 (3 days)
- Lab $550 or $400 with Full Reg (Ophthalmology - includes Ophthalmic surgery kit)

AHT’s & Vet’s Assistant’s
- Full $175 (3 days)
- Lab $175 or $125 with Full Reg (Parasitology)

Managers
- Full $275 (3 days)

Support Staff
- Full $125 (2 days)

For further information contact:
APVC Committee on Arrangements
Dr. Ernie Prowse - Chair
106 Maple Blvd
Truro, NS B2N 4N3

Email: eprowse@eastlink.ca
Tel: (902) 899-2233
Register online - www.apvc.ca
CVMA Attends CanWest

L’ACMV assiste à la Conférence CanWest

The CVMA was involved in the recent CanWest Conference in Banff, Alberta on October 13–16, 2012. Dr. Nigel Gumley gave a presentation for the companion animal stream on “Antimicrobial Decision Making for Companion Animal Practitioners — The CVMA Approach.” Dr. Gumley gave an overview of the CVMA antimicrobial decision-making tool that is under development, with specific focus on the urinary tract infection algorithm and treatment table.

Dr. Warren Skippon gave a presentation for the food animal stream on “The Role of CVMA in Livestock Antimicrobial Stewardship — What have we been doing and what needs to be done.” An overview of the issues of antimicrobial resistance in food animal veterinary medicine was presented, along with discussion about the Canadian regulatory “Black Hole” for antimicrobials. The CVMA guidelines for prudent use of antimicrobials in livestock were featured in this presentation.

The CVMA Animal Welfare Committee (AWC) visited the Western College of Veterinary Medicine (WCVM) for their annual fall meeting. The AWC visited the Pound Maker beef feedlot in Lanigan, Saskatchewan. The beef operation has a 28 500-head capacity and is Canada’s first integrated feedlot/fuel ethanol facility.

The AWC meeting featured a noon-hour presentation to the WCVM students by Dr. Terry Whiting. A packed lecture theatre heard Dr. Whiting give a presentation titled “A Hobbit’s Tale — there and back again: How an animal welfare crisis can impact mental health wellness.” This was an open, personal discussion about Dr. Whiting’s experience with a major mental health crisis that was precipitated by a mass livestock depopulation event in Manitoba. He discussed the global statistics of suicide, and the high risk of mental illness in the veterinary profession, particularly in the growing female demographic.

L’ACMV a participé à la Conférence CanWest qui s’est récemment tenue à Banff, en Alberta, du 13 au 16 octobre 2012. Le Dr. Nigel Gumley a donné une présentation dans le cadre du volet sur les animaux de compagnie portant sur la «Prise de décisions sur les antimicrobiens à l’intention des praticiens pour animaux de compagnie — L’approche de l’ACMV». Le Dr. Gumley a présenté un aperçu de l’outil de l’ACMV pour la prise de décisions sur les antimicrobiens qui est en voie d’élaboration, en s’attardant particulièrement sur l’algorithme et le tableau de traitement des infections des voies urinaires.

Le Dr. Warren Skippon a donné une présentation dans le cadre du volet sur les animaux destinés à l’alimentation portant sur «Le Rôle de l’ACMV dans la gestion responsable des antimicrobiens pour le bétail — Ce que nous avons fait et ce qui doit être réalisé». Un aperçu des enjeux liés à l’antibiorésistance en médecine vétérinaire des animaux destinés à l’alimentation a été présenté, ainsi qu’une discussion à propos du «trou noir» de la réglementation canadienne pour les antimicrobiens. Les lignes directrices de l’ACMV sur l’administration judicieuse des antimicrobiens chez le bétail ont été présentées lors de cet exposé.
Le Comité de l’ACMV sur le bien-être des animaux (CBA) s’est rendu au Western College of Veterinary Medicine (WCVM) pour sa réunion annuelle d’automne. Le CBA a visité le parc d’engraissement des bovins Pound Maker à Lanigan, en Saskatchewan. L’exploitation bovine possède une capacité de 28 500 têtes de bétail et elle est la première installation du Canada à posséder une capacité intégrée de parc d’engraissement et d’éthanol.

Dans le cadre de la réunion du CBA, une conférence du midi a été présentée aux étudiants du WCVM par le Dr Terry Whiting. Une salle comble a entendu la présentation du Dr Whiting intitulée : «L’histoire d’un Hobbit — aller-retour. Comment une crise de bien-être des animaux peut influencer la santé mentale». C’était une discussion personnelle et franche à propos des expériences du Dr Whiting vécues lors d’une crise de santé mentale majeure qui avait été précipitée par une dépopulation massive de bovins au Manitoba. Il a abordé les statistiques générales pour le suicide et le risque élevé de maladie mentale dans la profession vétérinaire, particulièrement dans le groupe grandissant de femmes.

Eastern Veterinary Technician Association’s Veterinarian of the Year

Dr. Ernie Prowse received The Veterinarian of the Year Award from the Eastern Veterinary Technicians Association (EVTA). The award was presented at the EVTA Annual Meeting in Moncton, New Brunswick on September 22, 2012. It was presented by Joye Sears, president of EVTA.

Vétérinaire de l’année de l’Eastern Veterinary Technician Association

Bovine Welfare Award
Prix pour la promotion du bien-être bovin

The Canadian Association of Bovine Veterinarians/Association Canadienne des Vétérinaires Bovins (CABV/ACVB) executive board and Boehringer Ingelheim (Canada) Ltd. announced Dr. Neil Anderson as the recipient of the 2012 Metacam 20 Bovine Welfare Award. Dr. Anderson is the lead veterinarian in bovine health and welfare at the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA).

“Scores of people taught and inspired me to learn about Nature’s way, cow behavior, cattle well-being, and to share with others. Because of them, I’ve enjoyed going to barns, helping producers and cattle in their care, and seeing their accomplishments. I am grateful to the CABV/ACVB for this kind recognition and to Boehringer Ingelheim (Canada) Ltd. for their generous sponsorship. I cherish this award as an honor to everyone who made it possible for me and thank each of you,” said Dr. Anderson after being announced the recipient of the 2012 Metacam 20 Bovine Welfare Award.

The Metacam 20 Bovine Welfare award is given annually to a veterinarian, faculty member or a graduate student of a Canadian university to recognize his or her achievements in advancing the welfare of animals via leadership, public service, research/product development, and/or advocacy. By doing so, the CABV and Boehringer Ingelheim hope to raise public awareness of the important role veterinarians and animal scientists play in improving understanding of bovine welfare-related science and
ethics; ensuring that rearing of cattle used for human purposes is conducted responsibly; and attending to and promoting animal welfare within the context of responsible animal use.

Since the 1970s Dr. Neil Anderson has provided exemplary services to the Ontario beef and dairy industries as a practicing veterinarian and as extension veterinarian with OMAFRA. Dr. Anderson’s work in veterinary extension is founded on the strong correlation between animal welfare and animal productivity. Dr. Anderson has promoted the appropriate use of medication in livestock, the best designs for housing systems for dairy cattle and has crusaded for optimized feeding systems for dairy calves. He has advocated for humane treatment of animals through his writings, lectures and farm visits in Ontario as well as across Canada and internationally. Many veterinarians and dairy producers have had the pleasure to experience Dr. Anderson’s impact as a teacher, practicing veterinarian, mentor, agricultural extension educator, and as a true leader in the field of cattle welfare.

“We are very pleased to be able to initiate this award to honor those who have added so much to our knowledge of livestock behavior, animal welfare and animal well-being in Canada. These scientific fields have expanded so rapidly in Canada in the past few years that Boehringer Ingelheim thought it appropriate to be able to recognize those who have made outstanding contributions in these research and management areas. Thank you to the membership of the CABV/ACVB for graciously agreeing to undertake the task of seeking nominations and selecting the recipient” says Dr. Rob Tremblay, Bovine/Equine Specialist with Boehringer Ingelheim (Canada) Ltd. “We are particularly pleased that Dr. Neil Anderson is the first recipient of the award. Throughout his career, Dr. Anderson has been passionate about introducing new ideas and technologies to livestock agriculture. He has a real talent for helping people see common problems and common husbandry practices in an entirely different way, then help people implement practical solutions. The entire Canadian livestock industry has benefited from Dr. Anderson’s work. Well done.”

d’activité suivantes : leadership, fonction publique, recherche et développement de produit ou défense d’intérêts. Grâce à ce prix, l’ACVB et Boehringer Ingelheim espèrent mieux sensibiliser le public à l’importance du rôle joué par les vétérinaires et les scientifiques pour : améliorer la compréhension des aspects scientifiques et éthiques liés au bien-être bovin; assurer une utilisation responsable des bovins à des fins humaines; assurer et promouvoir le bien-être des animaux dans un contexte d’utilisation responsable des ressources animales.

Depuis les années 1970, le Dr Neil Anderson a fourni des services exemplaires aux industries laitière et bovine de l’Ontario à titre de vétérinaire praticien et vétérinaire de vulgarisation auprès du MAAARO. Le travail du Dr Anderson en vulgarisation vétérinaire se fonde sur la forte corrélation entre le bien-être des animaux et la productivité des animaux. Le Dr Anderson a promu l’utilisation appropriée des médicaments chez le bétail et les meilleures conceptions des étables pour les bovins laitiers, en plus de mener une croisade pour l’optimisation des systèmes d’alimentation destinés aux veaux laitiers. Par ses écrits, ses conférences et ses visites agricoles en Ontario, partout au Canada et ailleurs dans le monde, il préconise le traitement humain des animaux. De nombreux vétérinaires et producteurs laitiers ont eu le plaisir d’apprécier le Dr Anderson en tant qu’enseignant, vétérinaire praticien, mentor, éducateur en vulgarisation agricole et comme véritable leader dans le domaine du bien-être des bovins.

«Nous sommes très heureux de pouvoir instaurer ce prix afin d’honorer les personnes qui ont grandement contribué à accroître notre connaissance du comportement et du bien-être des animaux au Canada. Ces domaines scientifiques ont pris un tel essor au Canada depuis les dernières années que Boehringer Ingelheim a estimé qu’il serait approprié de reconnaître le travail des personnes qui ont contribué de façon exceptionnelle à ces domaines de recherche et de gestion. Nous remercions l’ensemble des membres de l’ACVB d’avoir aimablement accepté de se charger de la recherche des candidatures et de la sélection du lauréat», a précisé le Dr Rob Tremblay, vétérinaire au service technique chez Boehringer Ingelheim (Canada) Ltée. «Nous sommes particulièrement heureux que le Dr Neil Anderson soit le premier lauréat de ce prix. Tout au long de sa carrière, le Dr Anderson s’est passionné pour l’utilisation de nouvelles idées et technologies dans le secteur des animaux d’élevage. Il possède un réel talent pour aider les personnes à voir les problèmes courants et les pratiques courantes d’élevage d’une manière totalement différente, et il leur porte ensuite assistance afin de mettre en place des solutions pratiques. L’industrie canadienne des animaux d’élevage tout entière bénéficie du travail du Dr Anderson. Félicitations!»
European Journal of Companion Animal Practitioners

The 3rd online version of European Journal of Companion Animal Practitioners (EJCAP) is available now. It contains the usual continuing professional development (CPD) articles from all corners of Europe, as well as slideshows, quizzes, interviews and other extras.

After 21 years of bringing veterinary continuing education in print to companion animal practitioners throughout Europe, the EJCAP has now become fully interactive. As the official journal of the Federation of European Companion Animal Veterinary Associations (FECAVA), it is exclusively available to FECAVA members.

This issue includes reports from the FECAVA symposium on animal-assisted interventions (AAI), with exclusive interviews with the 3 keynote speakers, discussion of the “healing power” of animals, and the positive impact of pets in institutions.

FECAVA is grateful to its Prime Partners MSD Animal Health, Hills Pet Nutrition and Elanco Animal Health for their support of EJCAP online.

Register now!
Registration is easy; interested practitioners should simply go to EJCAP online (www.fecava.org/ejcap) and follow the instructions. Once registered and logged in, all EJCAP online and previous print volumes of EJCAP (available in pdf) can be accessed directly.

The new FECAVA Web site also contains information about FECAVA and its contact persons, a blog, policy statements and a calendar of events.

European Journal of Companion Animal Practitioners


La revue EJCAP, après 21 années de formation continue vétérinaire publiée en format imprimé à l’intention des praticiens pour animaux de compagnie de toute l’Europe, est maintenant présentée en format entièrement interactif. À titre de revue officielle de la Federation of European Companion Animal Veterinary Associations (FECAVA), elle est disponible exclusivement aux membres de la FECAVA.

Ce numéro comprend des rapports du symposium de la FECAVA sur les interventions à recours animalier ainsi que des entrevues exclusives avec les trois conférenciers principaux et la discussion du «pouvoir de guérison» des animaux et de l’impact positif des animaux de compagnie dans les institutions.

La FECAVA remercie ses principaux partenaires MSD Santé animale, Hills Pet Nutrition et Elanco Santé animale de leur appui d’EJCAP online.

Inscrivez-vous maintenant!
Il est facile de s’inscrire: les praticiens intéressés doivent simplement aller à EJCAP online (www.fecava.org/ejcap) et suivre les instructions. Après l’inscription et ouverture de session, on peut accéder directement à tous les volumes d’EJCAP online et aux numéros imprimés antérieurs d’EJCAP (disponibles en format pdf).

Le nouveau site Web de la FECAVA contient aussi des renseignements à propos de la FECAVA et de ses porte-parole, un blogue, des énoncés de politique et un calendrier des activités.
The College of Veterinarians of Ontario (CVO) protects and serves the public interest through the regulation of the practice of veterinary medicine in Ontario.

Regulators and professional associations share a good deal of common ground, which is perhaps why many of our provincial counterparts have chosen to work as combined agencies. In Ontario, we have separate voices for the profession and for the public, with the Ontario Veterinary Medical Association and the CVO each bringing a distinct perspective. While we often work in collaboration, we are unique and separate organizations. There are areas that are distinctly regulatory. Protection of the public interest is upheld by the licensure of veterinarians, accreditation of facilities and investigation of complaints and concerns with veterinarians. The CVO has been moving forward with policy and strategic projects in collaboration with the profession and various stakeholders throughout 2012.

The CVO has delivered policy initiatives on a range of issues, including an updated advertising advisory and an advisory to assist veterinarians with decisions on medically unnecessary veterinary surgery. Council also reviewed policy documents on the veterinarian-client-patient relationship, after-hours care and access to emergency services and quality assurance. Council has also proposed amendments to Regulation 1093. Council appreciates the input received from members, stakeholders and the public in making decisions on policy directions. All updated policies can be found on the CVO’s Web site (www.cvo.org).

The College welcomed its new registrar and Chief Executive Officer, Jan Robinson, early in 2012. Ms. Robinson has extensive experience in the regulatory health policy community. She continues to meet with members of the profession in their practices and through regional association meetings, as well as at the OVMA and CVMA conferences.

The 2012 Members’ Forum focused on the future of the CVO’s Quality Assurance program. The forum, which was also delivered to members via webcast, reinforced the value of the Quality Assurance program in supporting a high degree of competency across the profession and also building public confidence in practitioners’ expertise. The College is continuing to work with members and stakeholders while moving forward on its Quality Assurance program.

The College has also introduced new Minimum Standards for Veterinary Facilities in Ontario, which came into effect early in 2012. Ms. Robinson has extensive experience in the regulatory health policy community.

Le College of Veterinarians of Ontario (CVO) protège et dessert l’intérêt public par la réglementation de la pratique de la médecine vétérinaire en Ontario.

Les associations de réglementation et de services professionnels ont beaucoup en commun, ce qui explique probablement pourquoi bon nombre de nos homologues provinciaux ont choisi un fonctionnement conjoint. En Ontario, nous avons des voix distinctes pour la profession et le public, et l’Ontario Veterinary Medical Association et le CVO œuvrent dans leur domaine respectif. Même si nous travaillons souvent en collaboration, nous sommes des organismes uniques et distincts. Il y a des domaines qui se rapportent uniquement à la réglementation. La protection des intérêts du public s’effectue par l’octroi de permis aux vétérinaires, l’agrément des installations et l’enquête sur les plaintes et les préoccupations des vétérinaires. Le CVO a continué de réaliser des projets de politiques et de stratégies en collaboration avec la profession et les divers intervenants pendant 2012.


Le CVO a accueilli sa nouvelle registraire et première directrice, Jan Robinson, au début de 2012. Mme Robinson possède une vaste expérience dans la collectivité des politiques de réglementation de la santé. Elle continue de rencontrer des membres de la profession dans leurs pratiques et lors de réunions d’associations régionales ainsi que lors des conférences de l’OVMA et de l’ACMV.

Le Forum des membres 2012 a porté sur l’avenir du programme d’assurance de la qualité du CVO. Le forum, qui a aussi été transmis aux membres par webémision, a renforcé la valeur du programme d’assurance de la qualité en appuyant un niveau élevé de compétence dans la profession et en rehaussant la confiance du public à l’égard de l’expertise des praticiens. Le CVO continue de travailler avec les membres et les intervenants tout en poursuivant son travail sur le programme d’assurance de la qualité.

Le CVO a aussi introduit des normes minimales pour les installations vétérinaires en Ontario qui sont entrées en vigueur le 1er septembre 2012, après une vaste consultation auprès des membres. Les nouvelles normes se trouvent sur le site Web du CVO et les changements sont mis en évidence.

Le CVO continue de travailler en partenariat et en consultation avec l’OVMA, le ministère de l’Agriculture, de...
September 1, 2012, following thorough consultation with the members. The new standards, highlighting the changes, can be found on the College’s Web site.

The CVO continues to work in partnership and consultation with the OVMA, the Ontario Ministry of Agriculture, Food and Rural Affairs, the Ontario Association of Veterinary Technicians, the Office of the Fairness Commissioner, and other ministries with responsibilities that influence or impact aspects of the veterinary profession. The CVO has also demonstrated its commitment to accessible customer service with its compliance with the province’s new Accessible Customer Service Regulation.

The CVO has been embracing technology in efforts to be more efficient, eco-friendly and flexible in delivering its programs, information and resources. The College has adopted a robust database management system to maintain the register, conduct on-line licence renewals and manage member relations. As well, the CPD Cycle Portal was launched in 2011, enabling veterinarians to submit their data electronically. In other initiatives, the College conducted its Council elections electronically this fall.

It has been a distinct pleasure to represent the CVO over the past year. I look forward to seeing the CVO continue to provide leadership for the veterinary profession in Ontario.

(by Dr. Ken Bridge, President, College of Veterinarians of Ontario)
The most notable event in 2012 for the University of Calgary Faculty of Veterinary Medicine (UCVM) was the May 10th convocation of the first graduating class of 30 DVM students and the 1st PhD student in our Veterinary Medical Sciences graduate program. All DVM students successfully completed the NAVLE on their 1st attempt and had found employment by convocation. Twenty-six students are working in Alberta (with 60% serving rural Alberta and 3 in internships) and 3 are pursuing internships in the United States.

Dr. Ole Nielsen was inducted into the Order of the University of Calgary at convocation for his contributions to the establishment of UCVM. The former dean of the Western College of Veterinary Medicine and the Ontario Veterinary College used his extensive knowledge and diplomacy to engage practicing veterinarians and academics to support the creation of UCVM.

The majority of the 4th year of the DVM program is delivered through partner practices in a Distributed Veterinary Teaching Hospital (DVTH). All students complete 12 weeks of general veterinary practice (4 weeks each of food animal, equine, and small animal medicine and surgery) and 4 weeks in a rural community practice in rotations supervised by DVTH clinical instructors. The mandatory program also includes 4 weeks of laboratory diagnostics on campus. Students select a 10-week program in one of 4 “areas of emphasis”: production animal health, ecosystem and public health, equine health or investigative medicine. Finally, they pursue 10 weeks of open electives. Students spend 60–70% of their 4th year program off-campus in the DVTH and core faculty are engaged in about 50% of rotations. Coupled with the extensive clinical and professional skills in the first 3 years, the extensive primary care exposure achieved through the DVTH program ensured that the students graduated with excellent clinical reasoning and practical skills.

Employment opportunities for graduates in western Canada appear to remain strong, despite the recent discussions regarding
demands for veterinarians in North American. Similarly, demand for program entry remains high, with a 15% increase in qualified candidates in 2012. Over 210 students applied for the 32 available seats at UCVM.

On July 1, 2012, UCVM launched its Strategic Directions for 2012–2017. UCVM has identified key goals for the next 5 years in pursuit of its visions of bringing innovation and community together to advance animal and human health. The UCVM has established goals in 5 key areas: DVM education; graduate education and advanced clinical training; research; community learning; and return to community. The complete document can be read at (www.vet.ucalgary.ca/system/files/VetMedStrategicDirMar2012.pdf).

As part of our strategy, we have committed to demonstrating the effectiveness of our educational practices. We have invested over $1 million dollars in veterinary education research, including developing and assessing the use of simulators, simulations and technology in education. In August, UCVM hosted over 100 international veterinary educators at the INVEST (International Veterinary Simulation in Teaching) 2012 Conference that showcased new simulators and how they help teach veterinary clinical skills. Recent models created by UCVM faculty, in conjunction with Calgary-based Veterinary Simulator Industries Ltd, include an equine palpation simulator, a horse distal limb model for teaching nerve and joint blocks, and a model for teaching canine ovariohysterectomies.

Our graduate education and research programs also continue to grow. UCVM faculty now supervise approximately 110 graduate students and bring in over $12 million a year in extra-mural funding. In the last 18 months, we have invested nearly $2.5 million to enhance our strategic research areas, support graduate education and encourage interdisciplinary research. Recently, Drs. John Gilleard, Susan Kutz and James Wasmuth — along with 4 other U of C researchers — received $1.6 million for an NSERC Collaborative Research and Training Experience (CREATE) program in Host-Parasite Interactions.

Over the last year, we recruited 12 new faculty members: Dr. Cameron Knight (anatomic pathology), Mark Ungrin, PhD (tissue bioengineering); Dr. Serge Chalhoub (small animal internal medicine); Tuan Trang, PhD (pharmacology of pain); Dr. Cary Hashizume (small animal clinical sciences); Dr. Matt Read (anesthesiology & therapeutics); Dr. Heidi Banse (therapeutics & equine internal medicine); Dr. John Kastelic (cattle reproductive health); Dr. Claudia Klein (equine & small animal theriogenology); Hermann Schatzl, PhD (immunology; prion disease); Dr. Mark Fuller (small animal surgery); and Dr. Eduoard Timsit (cattle health). Two other aspects of our Strategic Directions include Community Learning and Return to the Community. Community engaged research projects conducted over the summer at the Calgary Stampede include Dr. Renaud Leguillette’s use of remote electrocardiogram equipment to monitor horses participating in chuckwagon races in order to assess their stress and fitness levels And Dr. Ed Pajor’s study to examine the stress and welfare of animals engaged in bucking and other performance events. Engaging and generating scientific evidence to address the health and welfare of performance animals is a way of supporting and leading changes in practice. Apprentissage communautaire; et retour à la collectivité. Le document complet peut être lu au (www.vet.ucalgary.ca/system/files/VetMedStrategicDirMar2012.pdf).

Dans le cadre de notre stratégie, nous nous sommes engagés à démontrer l’efficacité de nos pratiques éducatives. Nous avons investi plus de 1 million $ dans la recherche en enseignement vétérinaire, incluant l’élaboration et l’évaluation de l’utilisation de simulateurs, de simulations et de la technologie d’enseignement. En août, l’UCVM a accueilli plus de 100 enseignants vétérinaires étrangers lors de la Conférence INVEST (International Veterinary Simulation in Teaching) 2012 qui a présenté de nouveaux simulateurs et comment ils facilitent l’enseignement des compétences cliniques vétérinaires. Des modèles récents créés par les professeurs de l’UCVM, en collaboration avec Veterinary Simulator Industries Ltd de Calgary, incluent un simulateur de palpation équine, un modèle d’un membre distal pour l’enseignement de l’anesthésie d’un nerf et d’une articulation et un modèle pour l’enseignement des ovariohystérectomies canines.

Nos programmes d’études supérieures et de recherche continuent de croître. Les professeurs de l’UCVM supervisent maintenant environ 110 étudiants diplômés et rapportent plus de 12 millions $ par année en financement extra-muraux. Au cours des 18 derniers mois, nous avons investi près de 2,5 millions $ pour améliorer notre recherche stratégique, appuyer les études supérieures et encourager la recherche interdisciplinaire. Récemment, les D’ John Gilleard, Susan Kutz et James Wasmuth — de même que quatre autres chercheurs de l’Université de Calgary — ont reçu 1,6 million $ pour un Programme de formation orientée vers la nouveauté, la collaboration et l’expérience en recherche (FONCER) du CRSNGC dans les interactions hôte-parasite.

Au cours de l’an dernier, nous avons recruté 12 nouveaux professeurs : D’ Cameron Knight (pathologie anatomique), Mark Ungrin, Ph.D. (bio-ingénierie des tissus); D’ Serge Chalhoub (médecine interne des petits animaux); Tuan Trang, Ph.D. (pharmacologie de la douleur); D’ Cary Hashizume (sciences cliniques des petits animaux); D’ Matt Read (anesthésiologie et thérapeutique); D’ Heidi Banse (médecine interne thérapeutique et équine); D’ John Kastelic (santé de la reproduction des bovins); D’ Claudia Klein (thériogénologie des équidés et des petits animaux); Hermann Schatzl, Ph.D. (immunologie; maladie à prions); D’ Mark Fuller (chirurgie des petits animaux); et D’ Eduoard Timsit (santé des bovins). Deux autres aspects de nos orientations stratégiques incluent l’apprentissage communautaire et le retour à la collectivité. Des projets de recherche communautaires réalisées pendant l’été au Stampede de Calgary comprenaient l’utilisation d’équipement d’electrocardiogramme à distance du D’ Renaud Leguillette pour surveiller les chevaux participant à des courses de chariots bâchés et évaluer leur niveau de stress et leur condition physique et l’étude du D’ Ed Pajor pour examiner le stress et le bien-être d’animaux participant à des épreuves de ruades et autres compétitions. La mobilisation et la production de preuves scientifiques afin d’aborder la santé et le bien-être des animaux de performance est une façon d’appuyer et de produire des changements dans la pratique.
To support Community Learning, UCVM, in partnership with the ABVMA, delivered 4 hands-on clinical reasoning and skills courses in small animal anesthesia, small animal surgery, equine medicine and small animal medicine. The courses were designed for veterinarians changing practice fields, veterinarians wanting to upgrade skills in specific areas, or for foreign-trained veterinarians who had passed the NAVLE and were preparing for the clinical proficiency exam. The week-long courses were highly successful and will continue to be offered in the future.

We are proud of our progress over the last year. We look forward to continued growth and developing collaborative programs with our colleagues that further veterinary education and the veterinary profession in Canada.

(by Dr. Alastair Cribb, Dean, University of Calgary Faculty of Veterinary Medicine)

Pour appuyer l’apprentissage communautaire, l’UCVM, en partenariat avec l’ABVMA, a présenté quatre cours de raisonnement et de compétences cliniques pratiques en anesthésie des petits animaux, en chirurgie des petits animaux, en médecine équine et en médecine des petits animaux. Les cours étaient conçus pour les vétérinaires changeant de domaines d’exercice, les vétérinaires désirant mettre leurs compétences à niveau dans des domaines particuliers ou des vétérinaires formés à l’étranger qui ont réussi le NAVLE et se préparent à l’examen de compétences cliniques. Les cours d’une semaine ont connu un grand succès et continueront d’être offerts à l’avenir.

Nous sommes fiers de nos progrès au cours de l’an dernier. Nous nous réjouissons à la perspective de croissance et d’élaboration de programmes concertés avec nos collègues qui avantagent l’enseignement de la médecine vétérinaire et la profession vétérinaire au Canada.

(par Dr’ Alastair Cribb, doyen, Faculté de médecine vétérinaire de l’Université de Calgary)

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Laparoscopic-assisted cystotomy for urolith removal in dogs and cats — 23 cases

Cory B. Pinel, Eric Monnet, Michael R. Reems

Abstract — This report describes the outcomes of a modified laparoscopic-assisted cystotomy for urolith removal in dogs and cats. Modifications of the original techniques included a temporary cystopexy to the abdominal wall, utilization of a laparoscope instead of cystoscope, and retrograde flow of saline in the bladder with pressurized saline. The medical records of 23 client-owned animals for which laparoscopic-assisted cystotomy was used for urolith extraction were reviewed. Twenty-six procedures were performed in 23 animals. There were intraoperative complications in 19.2% of cases leading to open conversion in 11.5%. Rate of complications directly related to the procedure was 11.5%. Four cases had documented urolith recurrence with a mean time to recurrence of 335 days.

Résumé — Cystotomie assistée par laparoscopie pour l’enlèvement des urolithes chez les chiens et les chats — 23 cas. Ce rapport décrit les résultats d’une cystotomie assistée par laparoscopie pour l’enlèvement des urolithes chez les chiens et les chats. Les modifications des techniques originales ont inclus une cystopexie temporaire à la paroi abdominale et un flux rétrograde de la solution saline dans la vessie avec une solution saline sous pression. Les dossiers médicaux de 23 animaux appartenant à des propriétaires pour lesquels la cystotomie par laparoscopie avait été utilisée pour l’extraction des urolithes ont été examinés. Vingt-six interventions ont été réalisées chez 23 animaux. Il y a eu des complications peropératoires dans 19,2 % des cas causant une conversion ouverte à 11,5 %. Le taux des complications directement reliées à l’intervention était de 11,5 %. Pour quatre cas, il y a eu une récurrence documentée des urolithes avec une durée moyenne de 335 jours.

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Introduction

The incidence of calcium oxalate uroliths in dogs has increased in the last 20 to 25 y for reasons that are not clear (1,2). Persistence of uroliths within the lower urinary tract may lead to urinary tract infection, cystitis, hematuria, and/or urethral obstruction. Surgical extraction is the most commonly employed treatment for uroliths not amenable to dietary dissolution and/or those lodged in the urethra or urinary bladder. Frequently, urethroliths can be retroplused into the bladder avoiding the need for urethrotomy or a urethrostomy for removal. Furthermore, an open cystotomy to remove urocystoliths is the most common urinary procedure in veterinary practice and is associated with a low morbidity and mortality.

A laparoscopic-assisted cystotomy has been described to remove uroliths in the bladder (3). Advantages with this technique were reduction of contamination of the abdominal cavity with urine and better visualization to permit a more thorough evaluation of the bladder and urethra (3–5).

Our objectives for this study are two-fold: to describe several modifications made to the original technique initially developed by Rawlings et al (3,5), and to report on the clinical experience and outcomes encountered with performing laparoscopic-assisted cystotomy for urolith removal in a case series of dogs and cats.

Materials and methods

Case selection

The electronic databases of Colorado State University (CSU) and Florida Veterinary Specialists (FVS) were examined to identify all dogs and cats in which laparoscopic-assisted cystotomy was utilized for the removal of uroliths. Laparoscopic-assisted cystotomy has been used at CSU for urolith removal since early 2005 and at FVS since mid 2008. Records were identified from
March 2005 to February 2009. Cases with incomplete medical records (including detailed surgical reports and final diagnoses), or those in which case follow-up could not be done (referring veterinarian or owner phone call), were excluded from further investigation.

Medical records review
Medical records were reviewed to determine signalment, history, final diagnosis (i.e., urolith analysis), type and result of diagnostic imaging, duration of the surgery, intraoperative complications, postoperative management, and time to recurrence. Intraoperative complications were defined as any episode noted in the surgical report that indicated deviation from the expected routine operative procedure (description follows). Cases in which open conversion to laparotomy was performed were also noted. Follow-up time was determined as the most recent time an owner was contacted regarding the urinary status of the animal. Follow-up time was determined by documented telephone communication between the referring veterinarian and owner. The data are presented as mean and range unless otherwise indicated.

Surgical technique
Laparoscopic-assisted cystotomy was performed in a similar manner to the original description by Rawlings et al (3, 5). All surgeries were performed by 2 veterinarians, either EM (n = 24) or MR (n = 2). Pneumoperitoneum was established either by Veress needle or open (Hasson) technique (6). The laparoscopic portal was established at the level of the umbilicus. A second portal was established caudal to the first for introduction of a 5-mm cannula and Babcock grasping forceps. The second portal was placed cranial to the prepulse in male dogs and about 2/3 of the way between the pubis and umbilicus in male and female cats and female dogs. The instrument cannula was placed in a location to allow the urinary bladder to be grasped at or near the apex and pulled cranial to the ventral abdominal wall, under laparoscopic guidance. The instrument cannula was removed. An approximately 3 to 4 cm approach was made to the proposed cystostomy site with a scalpel blade. With tension on the urinary bladder and slight eversion of the urinary bladder wall, a 360° temporary cystostomy was performed using 3-0 or 4-0 polydioxanone suture (PDS II; Ethicon, Somerville, New Jersey, USA) to securely anchor the urinary bladder to the ventral body wall, creating a tight seal to prevent movement of urine and uroliths into the abdominal cavity. The cystostomy suture passed full thickness in the bladder wall and the abdominal wall. The skin was incorporated in the cystostomy for small dogs at FVS only. A small stab incision was made into the ventral mid body of the urinary bladder through which the 5-mm laproscope within its cannula was then positioned within the urinary bladder. Saline was infused through a preoperatively placed urinary catheter via a manually inflated pressure bag at 300 mmHg. An assistant maintained infusion pressure during the procedure by visually monitoring the pressure gauge. Uroliths were flushed from the urinary bladder under high pressure and removed with suction attached to the ingress/egress portal of the cannula. Uroliths trapped within the lumen of the cannula were removed from the urinary bladder either through the suction via the ingress/egress portal or with the cannula as it was withdrawn from the urinary bladder. For uroliths too large to be removed in this manner, grasping forceps were introduced into the urinary bladder immediately adjacent to the scope. Following removal of all visible cystic uroliths, the urinary catheter was slowly withdrawn and the urethra was examined with the endoscope for remnant uroliths. Frequently, a small portion of the urinary bladder wall was excised and submitted for bacterial culture and sensitivity and/or histopathology. The cystotomy incision, linea alba, subcutis, and skin were closed routinely with single layer appositional patterns. Post-operative imaging was done at the surgeon’s discretion and was often omitted if there was a high confidence in complete urolith removal.

Results
Signalment
Twenty-five records were examined and 23 (17 dogs, 6 cats) were included in this study. Two cases were excluded due to inability to obtain follow-up information. Seventeen dogs, 14 castrated males and 3 spayed females, were included. One dog had surgery twice and one dog had surgery 3 times. The mean age of the dogs at the time of surgery was 8.7 y (range: 3.0 to 15.9 y). The mean body weight of dogs at the time of surgery was 20.1 kg (2.5 to 54 kg). The breeds of dogs included: dalmatian (n = 3), Yorkshire terrier (n = 2), mixed breed (n = 2), and 1 each of basenji, cairn terrier, Jack Russell terrier, Lhasa apso, Maltese, miniature schnauzer, Newfoundland, samoyed, shiba inu, and West Highland white terrier.

Six cats were included in the study. The mean age of cats at the time of surgery was 6.3 y (range: 0.7 to 10.8 y). The mean body weight of cats at the time of surgery was 4.9 kg (range: 3.9 to 6.1 kg). Three cat breeds were represented: domestic short hair (n = 4), domestic long hair (n = 1), and Siamese (n = 1). Five cats were castrated males, 1 was a spayed female.

Pre-operative diagnostic imaging
All cases had non-contrast abdominal radiographs before surgery (n = 26). Twenty-two of 26 (85%) had evidence of radiopaque uroliths. Preoperative urethrocystograms were performed in 6 cases (4 were positive contrast alone, 2 were double contrast). Urethrocystograms were performed to document the presence of radiolucent uroliths (2), show mucosal filling defects consistent with small radiopaque uroliths (1), or as part of a retrohydropulsion procedure used to move uroliths from the urethra to the urinary bladder (3). All 6 were diagnostic for cystic and/or urethral uroliths.

Four cases required an imaging technique in addition to non-contrast radiographs to diagnose the presence of uroliths. In 3 cases, abdominal ultrasound showed hyperechoic foci with acoustic shadowing (2 discrete uroliths, 1 echogenic sediment) when non-contrast radiographs failed to diagnose the presence of uroliths. Double contrast urethrocystogram diagnosed large radiolucent filling defects in the fourth case.

Preoperative ultrasonographic evaluation of all abdominal structures was performed on 14 cases and 10 (71%) were diagnostic for discrete cystic uroliths.
Surgery

Uroliths were removed in 14 cases through the use of suction applied to the laparoscopic cannula alone (54%). Additional grasping devices (such as laparoscopic Babcock forceps and Alligator grasping forceps) were required to remove larger uroliths in 8 cases (31%).

Intraoperative complications were reported for 5 cases (19.2%) resulting in conversion to an open procedure in 3 cases (11.5%). Puncture of the spleen with mild hemorrhage occurred following placement of the Veress needle in 1 case that did not require conversion to an open procedure. The laparoscopy had to be converted during surgery to a laparotomy because of a problem related to the technique in 3 cases. In 1 case uroliths were large and the window had to be enlarged at the apex of the bladder, then distention of the bladder could not be maintained to pursue the procedure. In another case the urinary bladder was too inflamed and firm to be grasped with Babcock forceps. Tearing of the bladder wall occurred when it was grasped with a Babcock forceps. This cat had previous cystotomies for bladder uroliths and chronic, severe cystitis. In a third case, the laparoscopy in a cat had to be abandoned because the flow of saline through the small urinary catheter was not sufficient to maintain good visualization during the cystoscopy. In 1 case a single urethrolith lodged in the urethra was missed during laparoscopic-assisted cystotomy and was identified on postoperative radiographs. The clinician retroflexed the urethra into the bladder and pursued an open cystotomy instead of repeating a laparoscopic-assisted cystotomy because sterile laparoscopy equipment was not available. This case was not considered as a true conversion since it was related to a lack of instruments to repeat the procedure.

Eleven cases (42%) had an additional procedure performed during the same anesthetic event. Three cases had a laparoscopic liver biopsy, one had laparoscopic-assisted gastropexy, and 3 had urinary bladder wall biopsy performed following the cystoscopy. One case had intraoperative radiation therapy for transitional cell carcinoma of the urinary bladder. One cat had nasal plenum biopsy, in which sporotrichosis was diagnosed. One cat received a perineal urethrostomy during the same anesthetic period because of chronic lower urinary tract obstruction. Mean operative time for laparoscopic-assisted cystotomy was 84.3 min ± 35.8 min (n = 17). Operative time for laparoscopic-assisted cystotomy that was converted to open (total surgical time) was 83.3 min ± 65.3 min (n = 3).

Postoperative complications

Complications are summarized in Table 1. In the post-operative period 1 cat that had urinary incontinence prior to surgery and 1 dog developed urinary incontinence that did not require treatment. The incontinence improved or resolved on its own within 2 wk of surgery. One dog developed stranguria that resolved in 1 wk. No uroliths were present on the post-operative radiographs and no urinary tract infection was present. The dog that received intraoperative radiation therapy developed pancreatitis and aspiration pneumonia after surgery for metastatic transitional cell carcinoma and was euthanized at the owner’s request 3 d after surgery. One cat died of septic peritonitis following a urethral tear during pre-operative management of the case. One cat with tenesmus after surgery developed a rectal prolapse and a herniation through one of the cannula holes. One cat had a seroma at 1 cannula hole. One cat developed renal failure following administration of non-steroidal inflammatory drugs (NSAIDs) after surgery.

### Table 1. Summary of peri-operative case complications of dogs and cats undergoing laparoscopic-assisted cystotomy for urolith removal

<table>
<thead>
<tr>
<th>Signalment</th>
<th>Complication</th>
<th>Conversion</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 y MC Mix</td>
<td>Uroliths too large to be removed, laparoscopic-assisted</td>
<td>Yes</td>
<td>Uroliths removed by open cystotomy</td>
</tr>
<tr>
<td>11 y MC DLH</td>
<td>Bladder too large/friable to be grasped</td>
<td>Yes</td>
<td>Uroliths removed by open cystotomy</td>
</tr>
<tr>
<td>5 y MC DSH</td>
<td>Incomplete bladder distension due to poor saline flow</td>
<td>Yes</td>
<td>Uroliths removed by open cystotomy</td>
</tr>
<tr>
<td>9 y FS Mix</td>
<td>Mild post-operative urinary incontinence</td>
<td>No</td>
<td>Resolution without management by 2 wk after surgery</td>
</tr>
<tr>
<td>16 y MC Yorkshire terrier</td>
<td>Mild post-operative urinary incontinence</td>
<td>No</td>
<td>Resolution without management by 2 wk after surgery</td>
</tr>
<tr>
<td>9 y MC Siamese</td>
<td>Chronic urinary incontinence</td>
<td>No</td>
<td>Improved after surgery but did not resolve completely</td>
</tr>
<tr>
<td>3 y FS Maltese</td>
<td>Stranguria</td>
<td>No</td>
<td>Resolved by 1 wk after surgery without further therapy</td>
</tr>
<tr>
<td>15 y MC West Highland white terrier</td>
<td>Pancreatitis, aspiration pneumonia after surgery</td>
<td>No</td>
<td>Euthanasia after surgery</td>
</tr>
<tr>
<td>1 y MC DSH</td>
<td>Septic uroabdomen, peritonitis, urethral tear</td>
<td>No</td>
<td>Euthanasia after surgery</td>
</tr>
<tr>
<td>5 y FS DSH</td>
<td>Tenesmus, rectal prolapse, cranial port body wall dehiscence</td>
<td>No</td>
<td>Primary herniorrhaphy, colopexy with resolution of prolapse, hernia, tenesmus</td>
</tr>
<tr>
<td>5 y MC DSH</td>
<td>Cranial port seroma</td>
<td>No</td>
<td>Resolution with warm compress</td>
</tr>
<tr>
<td>7 y MC DSH</td>
<td>Acute renal failure secondary to suspected meloxicam toxicity</td>
<td>No</td>
<td>Resolution with discontinuation of meloxicam, oral gastroprotekants, subcutaneous fluids</td>
</tr>
</tbody>
</table>

*MC — male castrated, FS — female spayed, Mix — mixed breed dog, DLH — domestic longhair cat, DSH — domestic shorthair cat.*
Diagnosis: Median time of follow-up was 449 d (range: 1 to 946 d).

Urolith analysis was submitted in 25 of 26 cases. In 13 cases, the urolith was primarily calcium oxalate (52%), in 5 cases they were primarily ammonium urate (20%), in 5 cases they were primarily cystine (20%), and in 2 cases they were primarily struvite (8%). Urinary bladder wall was submitted for histopathology in 4 cases. Biopsy results were: unremarkable (n = 1), interstitial hemorrhagic cystitis (n = 1), and chronic, suppurative cystitis (n = 2).

Follow-up:
Eight of the 26 cases (30.8%) were discharged on additional medications for the primary purpose of preventing recurrence of urolithiasis [potassium citrate (n = 5), allopurinol (n = 2), N-(2-Mercaptopropionyl) glycine/Thiola (n = 1)]. Follow-up time was determined by documented telephone communication between the referring veterinarian and owner (n = 6), examination(s) at CSU (n = 5), and telephone contact with the owner (n = 8). Median time of follow-up was 449 d (range: 1 to 946 d).

Time to recurrence:
Four cases (6 surgeries) had return of clinical signs and non-contrast radiographs showed urolith recurrence. The mean time to recurrence was 335 d (range: 45 to 856 d). Urolith analysis showed cystine uroliths recovered from 4 surgeries and calcium oxalate monohydrate from the remaining 2.

Discussion:
Three primary modifications were developed in this study compared with the previously published technique (3). A temporary complete cystotomy was performed with the abdominal wall instead of placement of 4 stay sutures to secure the bladder. The goal was to limit manipulation of the bladder and limit the risk of contamination of the peritoneal cavity with urine during the surgery. A laparoscope with a 5-mm cannula instead of a cystoscope was used to gain access to the bladder. The laparoscope does not have a working channel in which to place forceps or a basket for capturing uroliths. However, the 5-mm cannula used to gain access to the bladder allows the creation of a flow of saline to flush the uroliths out of the bladder without the need for forceps. Larger uroliths can be grabbed with forceps introduced along the cannula. Unlike the case with the cystoscope, the forceps operate independently of the laparoscope, making its utilization simple. The 5-mm laparoscope provides a larger viewing window and greater image resolution than the 2.7 mm cystoscope. Also, utilization of the laparoscope used for the initial inspection of the abdominal cavity and localization of the bladder minimizes the amount of equipment required during the procedure since a cystoscope is not used. Finally, creation of a retrograde flow of saline helps to flush the uroliths out of the bladder. The flow of saline created with a cystoscope is forward. The high flow of saline also improves visualization because of distension of the urinary bladder wall and dilution of active bleeding. Since placing the largest red rubber or Foley urethral catheter possible is a routine procedure for a cystotomy for urolithiasis in our institutions to either retropulse urethral uroliths into the bladder or to prevent migration of uroliths in the urethra at the beginning of the procedure, maintaining placement of the catheter does not add any extra steps to the procedure (Figure 1). At the end of the procedure the catheter can be removed with a constant high flow of saline and the endoscope simultaneously advanced into the dilated urethra to ensure uroliths are not left in the proximal urethra (Figure 2). The endoscope cannot advance past the ischiatic curvature in male dogs. This procedure cannot be performed in cats because of the size of the urethra. A smaller endoscope might be needed. The high flow of saline combined with a large diameter catheter facilitates displacement of any uroliths lodged in the distal urethra. In 1 male cat, the catheter placed was not sufficient to create an adequate flow of saline to flush the uroliths out of the urinary bladder.

Laparoscopic-assisted cystotomies were all performed with midline incisions even in male dogs and not paramedian as described by Rawlings et al (3), which allows the incisions to be restricted to the linea alba. This reduces hemorrhage and soft tissue trauma compared with an incision through the muscular portion of the rectus abdominis.

Complication rates during laparoscopy in dogs have been reported in 0% to 50% of cases (7–12). The intraoperative complication rate in this study (19%) is well within the range of the complication rates reported. It is difficult to compare complication rates between procedures because the levels of complexity of the procedures are not similar. Also it is difficult to differentiate a complication truly related to laparoscopy (puncture of spleen with Veress needle) from a complication related to the surgery itself (stranguria, or urinary incontinence after urolith removal). For example, Mayhew and Brown (7) reported bleeding for 100% of the ovarian pedicles ligated with clips during ovarioectomy; however, the cause of the bleeding was more likely related to the kind of clips and not the laparoscopy. Complications related to laparoscopy in our study were puncture of the spleen by the Veress needle, lack of flow of saline, and uroliths remaining in the urethra at the end of the procedure. Introduction of the Veress needle to establish pneumoperitoneum resulted in splenic laceration in 1 case. Hasson’s technique is an alternative technique to limit trauma to intra-abdominal organs (6). In 1 male domestic shorthair cat, the flow of fluid was insufficient to provide a clear cystoscopic view. It is important to place the largest diameter urinary catheter possible to create a good retrograde flow of saline to maintain the necessary urinary bladder inflation during the procedure; however, this might be difficult in male cats because of the diameter of the urethra. As an alternative, it would have been possible to use a cystoscope in lieu of the laparoscope and use one of the channels to inflate the urinary bladder either in addition to or instead of infusion through the urinary catheter (3–5,13). Unfortunately, this...
alternative does not produce a retrograde flow of saline that will flush the uroliths out of the urinary bladder easily. On the contrary, it may also create a forward flow of saline that may push uroliths through the urethra. In another cat the urinary bladder could not be grasped due to its thickened chronically inflamed wall. The cat had a history of repeated urinary tract obstruction and had a perineal urethrostomy performed following the cystotomy. The use of a more caudal cystoscopic port, placing and positioning the animal in a Trendelenberg position to allow the urinary bladder to fall as cranial as possible, or placement of stay sutures for traction may help to alleviate this concern (14).

Finally, in a mixed breed dog with recurrent cystine urolithiasis, several uroliths were encountered that were too large to be removed through the cystoscopic window, necessitating conversion to open cystotomy and enlargement of the cystotomy. This case was complicated by the chronic cystitis causing significant thickening of the urinary bladder wall. There is a limit to the size of urolith that can be removed with laparoscopic-assisted cystotomy. Patients with uroliths larger than 5 to 10 mm may not be good candidates for laparoscopic surgery.

Postoperative complications were present in 35% of the cases, but none were directly related to the laparoscopy procedures. Rectal prolapse and abdominal wall herniation have been reported previously in cats with urinary obstruction (15,16). The urethral tear likely occurred during catheterization of the urethra to decompress the urinary bladder in the preoperative period. Uroabdomen was not diagnosed before surgery because a urinary catheter was maintained until the time of surgery. The tear was not observed during the cystoscopy. Stranguria and mild urinary incontinence resulting from urethritis and cystitis have been reported (17). The animal that developed an acute pancreatitis underwent intraoperative abdominal radiation therapy at the time of surgery. The etiology of acute pancreatitis in the dog is not entirely understood; however, surgical manipulation/trauma, anesthetic-induced ischemia, or radiation damage may all have precipitated this complication (18).

A single male Newfoundland dog which had 1 previous laparoscopic cystotomy for cystine uroliths, was noted to have a single remnant urolith within the urethra visible on postoperative radiographs. This case was then managed with open cystotomy, allowing successful removal of the urolith. Only 10 cases had follow-up radiographs performed to confirm complete urolith removal because a thorough evaluation of the urinary bladder and 2/3 of the urethra in male dogs or the entire urethra in female dogs could be completed with the endoscope. At the end of the procedure, the urinary catheter was removed slowly with a high flow of saline, and the endoscope was simultaneously advanced in the urethra to evaluate for residual uroliths. In males the endoscope could not pass the ischiatic curvature. Since a large diameter urinary catheter and high flow of saline were used, there was a high level of confidence that there were no uroliths remaining in the urethra. Postoperative radiographs were taken only when the surgeons were suspicious that uroliths could have been left in the lower urinary tract. Previous reports documented incomplete removal of uroliths in 14% to 20% of cats and dogs following routine open cystotomy (19,20). Failure to remove all uroliths was documented in 1 of 10 cases for which postoperative radiographs were obtained. Even after laparoscopic-assisted cystotomy post-operative radiographs are recommended to make sure no uroliths are left in the urinary system.

Long-term postoperative recurrence of urolithiasis may be attributable to remnant uroliths (pseudorecurrence) and remnant uroliths. Six cases had documented recurrence of cystic uroliths within 1 year of surgical removal is common due to the renal tubular defect that predisposes to urolith formation (21,22). Laparoscopic-assisted cystotomy might help prevent early recurrence/pseudorecurrence of urolithiasis. Magnification of laparoscopy aids visualization of
smaller uroliths (Figure 3). Most of the smaller uroliths observed with cystoscopy adhered to the urinary bladder wall, and suction via the cannula was used to remove them.

Procedural times for laparoscopic-assisted cystotomy could not be calculated accurately because several other procedures were performed during the same anesthesia in 11 cases. Discrete procedural start and stop times were not always indicated on anesthetic case logs. The time reported in this study is longer than the surgical time reported for open cystotomy (63 min ± 30 min) (19). As with all minimally invasive procedures, there is a significant learning curve that must be overcome by the surgeons and technical staff when implementing new techniques. Different surgeons with various levels of experience performed the procedures. The total operative time was used, likely leading to an overestimate of the procedural time.

Converting to an open procedure is always a possibility during any minimally invasive surgery for the safety of the patient, and should be decided sooner rather than later to minimize surgical time. Technical difficulties such as chronic cystitis preventing correct manipulation of the bladder, inadequate flow of saline, and size of the uroliths were the reasons for converting to an open procedure in this study.

Laparoscopic-assisted cystotomy with 3 modifications of the original technique described by Rawlings et al (3,5) for removal of uroliths was accomplished with relative safety and efficacy in cats and dogs of a wide range of sizes. In future, most complications could be avoided with better case selection; a key factor in the success of minimally invasive surgery. Size of the uroliths, size of the patient (diameter of urethra in cats), and chronic cystitis might be factors to consider before attempting a laparoscopic-assisted cystotomy for treatment of urolithiasis. A prospective clinical trial would be appropriate to compare outcomes between laparoscopic assisted cystotomy and traditional open cystotomy.

References
The Ontario Veterinary College Hip Certification Program — Assessing inter- and intra-observer repeatability and comparison of findings to those of the Orthopedic Foundation for Animals

Heather J. Chalmers, Stephanie Nykamp, Assaf Lerer

Abstract — In Canada, the Ontario Veterinary College (OVC) has offered radiographic screening for hip dysplasia for many years, but there are other options for this service including the Orthopedic Foundation for Animals (OFA). There are some differences between the OFA and the OVC methods, and this study compares the OVC and OFA hip certification results in 37 dogs. There was good agreement between the two programs but in some instances there was a difference in the pass/fail status of a dog. Neither the OFA nor the OVC was more likely to fail or pass a given dog. The repeatability of the OVC results was assessed by both inter- and intra-observer comparisons in 100 dogs. There was at least 86% agreement among and within radiologists, but in 5 cases the disagreement resulted in a difference in the pass/fail status of the dog. These results illustrate the inherent variation in radiographic hip evaluation and highlight the importance of consensus grading practices to improve the accuracy of hip evaluation.

Introduction

Canine hip dysplasia (CHD) is an important and common problem for pet and breeding dogs in Canada and worldwide. The disease has a known genetic basis and is heritable; however, environmental factors impact the phenotypic expression and the severity of the disorder in affected individuals (1–6). The disease is progressive, and once initiated can result in reduced range of motion, pain, and lameness (7,8). Early diagnosis of hip dysplasia is essential to facilitate early management strategies and to prevent breeding of affected individuals.

Changes in hip joint congruity and stability may be detected on orthopedic examination including the Ortolani sign and Barden test (9–11); however, radiographic evidence is necessary to determine the nature and severity of the hip dysplasia, to assess for secondary degenerative joint disease, and facilitate treatment planning in affected dogs. Dogs with hip dysplasia may exhibit a range of radiographic findings, with abnormalities including variable degrees of hip joint incongruity, subluxation, and degenerative joint disease (12).

Screening programs for hip dysplasia have traditionally involved radiographic assessment of the hip joints of young adult dogs, and there are many such programs available worldwide. These include the Orthopedic Foundation for Animals (OFA) program, Pennsylvania Hip Improvement Program.
(PennHIP), Fédération Cynologique Internationale (FCI), the British Veterinary Association hip scheme, the Ontario Veterinary College Hip Certification program, and numerous other breed specific and/or country specific programs. While these organizations share the common goals of facilitating early diagnosis and reducing the incidence of CHD in the dog population, each organization has its own specific methods and grading schemes. As a result, it can be difficult for breeders, pet owners, and even veterinarians to compare results between the various programs. It is our impression that the most commonly used programs in Canada are the OVC Hip and Elbow Certification Program (OVC-HCP), the PennHIP, and the OFA program. Of these, the OVC-HCP and the OFA have similar systems requiring a ventrodorsal hip extended radiograph of the pelvis (13). In addition to the traditional view, PennHIP utilizes a dynamic radiograph series in which the passive hip laxity is calculated. In order to perform the PennHIP test, an individual must acquire special training leading to certification (14).

The OFA is a non-profit organization founded in 1966. The OFA maintains the world’s largest database of radiographic hip evaluations. Radiographs submitted to the OFA are assessed by 3 board-certified radiologists; once submitted, the radiographs are not returned. The OFA hip grading method consists of 3 main outcomes; pass, borderline, fail. Dogs which receive a passing score are assigned to 1 of 3 categories: Excellent, Good, or Fair. Dogs which receive a fail score are assigned 1 of 3 grades: Grade 1, 2, or 3, which represent increasing severity. The OFA provides certification services on dogs that are a minimum of 24 mo of age, and also offers preliminary assessment of younger dogs.

The OVC-HCP has been active for over 25 y, and certifies between 1200 and 5000 dogs per year. The program was started largely in response to the need for a Canadian option for breeders. At that time, breeders found that shipping radiographs to the United States for OFA evaluation resulted in long delays and increased costs associated with shipping and exchange rates. In order to address this need, the OVC began to offer hip and elbow certification using an OFA style ventrodorsal hip extended radiograph of the pelvis, which was evaluated by a board-certified radiologist. The program has other distinctions when compared to the OFA including that only 1 radiologist interprets each radiograph, dogs may be certified at a minimum of 18 months of age (with preliminary results available in younger dogs), and the original radiographs are returned to the client. From these beginnings, the program has evolved to include an online searchable database, and at present radiographs submitted to the OVC-HCP are assessed by 1 of 2 board-certified radiologists. The OVC hip grading system has 2 main outcomes: Pass and Fail. Dogs that receive a fail are assigned to Grade 1, 2, 3, or 4, representing increasing severity of CHD (Table 1). Despite being the only Canadian certification program and being a historical favorite of many Canadian breeders, the OVC method of assessing hips has not been scientifically evaluated to date.

Within the North American purebred dog industry, there is considerable breeding of dogs between provinces and states, and even internationally. Establishing the orthopedic health of a dog is an essential part of responsible breeding practice. Often, breeders and veterinarians use 1 program and become more familiar with interpreting results from that program than from others. This can create difficulty when a dog from 1 owner for which the OVC-HCP certificate is available plans a mating with a dog from another region for which the OFA results are available. It is therefore desirable to compare results between programs to assist breeders and veterinarians with decision-making. In some cases, it has been necessary to re-submit radiographs of a dog to a second program in order to satisfy all parties that the intended mating involves only orthopedically sound individuals. This is associated with increased cost for breeders because of submission fees and in some cases additional radiographs. Because the OFA and OVC-HCP utilize the same radiographic view and similar assessment criteria, it is desirable to establish some basic guidelines that can be used for extrapolation of results between the OFA scoring and the OVC scoring systems.

The goals of the current study were to i) establish the repeatability of the OVC-HCP method by establishing the inter- and intra-examiner repeatability of this method, and ii) determine the agreement between the OFA and the OVC-HCP results by comparing the findings between the 2 programs in a small subset of dogs.

### Materials and methods

#### Inter- and intra-examiner repeatability

A sample of 100 sequential cases submitted to the OVC hip screening program were enrolled in the study. Cases were excluded from the study if the radiographs were deemed to be of non-diagnostic quality or if the dog was less than 18 mo of age; these cases were replaced with the next case submission until 100 cases were enrolled. These 100 cases were randomized and

<table>
<thead>
<tr>
<th>OVC assessment</th>
<th>Typical findings</th>
<th>Result/Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASS Normal</td>
<td>No radiographic evidence of hip dysplasia, including normal hip conformation and no evidence of degenerative changes.</td>
<td>Certificate issued.</td>
</tr>
<tr>
<td>FAIL Grade I</td>
<td>Minimal or mild change is present including incongruity of hip joint, or reduced coverage of femoral head, or enthesiophyte on femoral neck.</td>
<td>No certificate, a report outlining radiographic findings and stating grade is issued.</td>
</tr>
<tr>
<td>Grade II</td>
<td>Moderate changes or more than one mild change are present.</td>
<td></td>
</tr>
<tr>
<td>Grade III</td>
<td>More than one moderate change is present.</td>
<td></td>
</tr>
<tr>
<td>Grade IV</td>
<td>Severe changes are present.</td>
<td></td>
</tr>
</tbody>
</table>
each radiologist completed the evaluation for each dog 3 times with a minimum of 24 h between readings (total of 6 evaluations per dog). For each reading, the radiologist was blinded to the previous results and the results of the other radiologist. In addition to performing the hip certification procedure, the radiologist was also asked if they would seek a second opinion on the case.

Method comparison study

The comparison between the OVC method and the OFA method was performed on 37 subjects, which were different from the 100 dogs previously described because the method comparison portion of the study was done after the repeatability portion. These subjects were taken as a subsample of dogs submitted to the OVC-HCP, with the inclusion criterion for participation in the study being dogs of at least 2 y of age and client consent during the study period (December 2010 — July 2011). Participation was solicited by posting the research project information on the OVC-HCP Web site and also by direct telephone or e-mail communication to clinics with a high submission rate to the program. Each radiograph was routinely read and graded by the radiologist on duty without knowledge of enrollment in the study. The assessment method is familiar to both radiologists participating in the study and is unmodified from the assessment method for routine submissions. Based on the radiograph, dogs were be assigned to 1 of the OVC-HCP grade categories (Table 1).

The same radiographs were scanned and digitally submitted to the OFA for routine evaluation. This was performed with consent of the OFA administration, and the OFA radiologist reading the cases was unaware of the study. The OFA results were collected and categorized according to the standard OFA scale (http://www.offa.org/hd_grades.html). The OFA evaluation was unmodified from a routine submission except that only 1 radiologist read each case.

Statistical methods

For the quantification of inter-observer repeatability within the OVC method, the intra-class correlation coefficient was calculated. Standard $2 \times 2$ tables were constructed for pass/fail between the 2 observers and for the need for a second opinion, and basic summary statistics were calculated. For the intra-observer repeatability, the kappa statistic was calculated with the most common response of each radiologist being used for the comparison. With regards to the choice to seek a second opinion, the kappa statistic was also calculated to compare the agreement between the 2 radiologists about the need for a second opinion. For the ordinal data, the OFA and OVC-HCP results were compared using a kappa statistic. For both the OVC-HCP and the OFA, the results were dichotomized for part of the analysis to determine the differences between the hip status of “pass” or “fail” between the 2 programs. For the OFA, the grades were dichotomized such that OFA grade excellent, good, fair were considered equivalent to “pass” and OFA borderline, mild, moderate, and severe were considered equivalent to “fail.” For the OVC-HCP, the dogs that passed and received a grade of I-IV hip dysplasia were considered to “pass.” The McNemar’s test was used to assess for overall bias of the 2 programs, or tendency of 1 program to rate consistently higher or lower than the other. For both study populations, the mean age, and sex distribution were compared to those for the general OVC-HCP submissions obtained via database query.

Results

Repeatability study

The 100 dogs in this portion of the study consisted of 68 females (64 intact and 4 spayed) and 32 males (29 intact and 3 castrated) with a mean age of 21.2 mo (range: 18 to 109 mo). Breeds represented included Labrador retrievers ($n = 29$), German shepherd dogs ($n = 20$), golden retrievers ($n = 14$), Bernese mountain dogs ($n = 7$), rottweilers ($n = 3$),oodle-standard berger allemande ($n = 2$), ($n = 2$), Labrador retriever crosses ($n = 8$), and 1 dog of each of 15 other breeds (lowchen, American cocker spaniel, bull mastiff, Alaskan malamute, Samoyed, Portuguese water dog, Irish setter, Newfoundland, border terrier, rough collie, smooth collie, weimaraner, German wire-haired pointer, Australian kelpie, great dane, greater Swiss mountain dog). The mean age and gender distribution did not differ from the means of the general submissions for the year of the study.

For the 100 dogs evaluated, the grade assigned to the dog was the same for all 6 observations a total of 86 times. Of the 14% of the time that there was any disagreement about the grade of a dog, this resulted in disagreement about the pass/fail status of the dog in 5/14 cases (35.7%). In 12/14 (85.7%) of the cases where there was disagreement regarding the grade, 1 or both radiologists stated that they would seek a second opinion. The most common type of disagreement either between or within observers was between grade I and grade II status (64.2% of all disagreements), and of the 5 cases in which the disagreement resulted in a difference in pass/fail status 4/5 were differences between grade I and normal and 1/5 was a difference between grade II and normal. The kappa for seeking a second opinion, representing the instances in which both radiologists sought a second opinion on the same case, was 0.26. One radiologist was significantly more likely to seek a second opinion than the other ($P < 0.05$). The combined occurrence of seeking a second opinion was 19/100 (19%), with 14/19 (73.6%) being sought by 1 radiologist and 5 being sought by the other radiologist. There was no difference between the 2 radiologists in the frequency of assigning the various grades. The kappa for inter-observer agreement for each observation was observation 1: 0.742, observation 2: 0.770, and observation 3: 0.787 (Fleiss-Cohen weighted kappa, squared weighting $P < 0.0001$ for all 3 observations). For the intra-observer agreement, the intra-class correlation coefficient was 0.78.

Method comparison study

The 37 dogs consisted of 12 intact males and 25 intact females with a mean age of 36.7 mo (range from 24 to 74 mo). The mean age was significantly different from the mean age of the general submissions of the year of the study ($P = 0.002$). Breeds represented included golden retrievers ($n = 4$), Labrador
Table 2. Results of OVC-HCP and OFA assessment in 37 dogs submitted for certification

<table>
<thead>
<tr>
<th>Results of OVC-HCP assessment</th>
<th>Excellent</th>
<th>Good</th>
<th>Fair</th>
<th>Borderline</th>
<th>Mild</th>
<th>Moderate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass</td>
<td>2</td>
<td>25</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grade I</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grade II</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Grade III</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

retrievers (n = 3), Shetland sheepdogs (n = 3), Irish water spaniels (n = 2), Alaskan malamutes (n = 2), Nova Scotia duck tolling retrievers (n = 2), and 1 of each of 21 other medium and large breeds.

The OVC radiologists gave 29/37 dogs a pass and 8/37 dogs a fail. Of the dogs that received a fail score from the OVC-HCP, 4 dogs received a Grade 1 score, 2 dogs received a Grade 2, and 2 dogs received a Grade 3 score (Table 2). No dog received Grade 4 score. The OFA gave 33/37 dogs a passing score and 4/37 dogs a failing score. No dog was given a borderline score. Out of the dogs that received a passing score, 2 dogs received an excellent score, 27 dogs received a good score, and 4 dogs received a fair score. From the dogs that received an OVC-HCP fail score, 3 dogs received Grade 1, and 1 dog received Grade 2. All the dogs which received a fail score from the OFA also received a fail score by the OVC, 4 dogs that received a passing score by the OFA received a fail score by the OVC; 2/4 of these dogs received an OFA grade score of good, and 2/4 dogs received an OFA grade score of fair.

When the dichotomized pass/fail status of the dog is considered, the kappa between OVC-HCP and OFA = 0.6105 [P = 0.0011, 95% confidence interval (CI): 0.2785 to 0.9425]. McNemar’s test of bias was not significant (P = 0.5). The odds ratio for passing OFA and failing OVC-HCP is 5.3 (median unbiased estimate, 95% CI: 0.66 to 157.5).

Discussion

Early and accurate screening for CHD is an essential component of canine breeding programs and several screening options are available to Canadian veterinarians and breeders. Radiographic assessment and measurements form the foundation of virtually all of these programs and the results are used by veterinarians and breeders to advance the orthopedic status of dogs through responsible breeding. In this study, we compared the hip joint grading score of the OVC-HCP and the OFA program. Both methods are based on a semi-quantitative evaluation of an extended coxofemoral joint in ventrodorsal view and are commonly used in Canada.

Overall, the correlation between the grading score provided by the 2 radiologists at OVC is categorized as good, as reflected by the ICC of 0.78 (15). There have been multiple studies assessing the repeatability of the various hip dysplasia scoring methods. For the PennHIP method, the ICC was reported by the PennHIP researchers to be between 0.85 and 0.94 (16) and more recently was reported to be as high as 0.96 (17). These authors have concluded that the PennHIP scores obtained by various trained observers could be considered interchangeable (17). A study that focused on agreement of the FCI method showed that inexperienced observers have poor agreement (ICC up to 0.44), while more experienced observers have good agreement (ICC up to 0.72) (18). In human medicine, the ICC for various radiographic hip scores range from poor (0.49) to excellent (0.97), with most studies reporting good repeatability (19,20). The wide range of results for agreement and the variable interpretation of what should be considered acceptable agreement complicate the interpretation of the current results.

One important difference between the OFA and the OVC-HCP is that with the OFA program, each radiograph is evaluated by 3 radiologists while at the OVC only 1 of 2 radiologists performs the evaluation on any given dog although a second opinion may be sought informally. As such, it is important to establish the inter-observer repeatability of the OVC-HCP scoring to ensure that the results are reliable between the 2 radiologists. Of the 100 dogs evaluated here, the radiologists gave the same score 86% of the time. Of the 14 dogs in which the 2 radiologists did not agree about hip score, this resulted in a difference in the pass/fail status of 4 dogs. However, in all of these cases 1 or both radiologists indicated that she/he would seek a second opinion before deciding on the final score for the dog. This reinforces the importance of the practice of seeking a second opinion and implies that there may be some benefit in implementing a more formal requirement for a second opinion as is routine with the OFA. This may include measures such as requiring 2 observers for each submission, or formalizing the process of seeking a second opinion.

Factors that affect inter- and intra-observer repeatability of OVC-HCP hip certification results could include technical quality of the radiographs (20), the individual set points/criteria of a given observer, experience of the observer, and bias relating to knowledge of information such as breed or age. In the present study, only radiographs of adequate technical quality are accepted by OVC-HCP and were included in the study. Additionally, the 2 observers are of similar experience and training and were blinded to the signalment information for the dogs. The observed differences are therefore most likely attributable to differences in the opinion and set points of the 2 radiologists. This type of difference of opinion is well-recognized in medical imaging as a common source of disagreement.

The comparison of various hip screening methods has been widely studied by many parties, with the aim of establishing which test is a more accurate predictor of the long-term hip status of the dog in order to make a recommendation of 1 program over another. In the current study, this was not the goal and the 2 programs are not being compared in order to determine...
which is superior, but rather in order to allow some understanding of differences between the programs. A gold standard in establishing the true hip status of a given dog was not available in this study; therefore, the results from the 2 programs cannot be compared to each other for assessing which results are more correct relative to a gold standard. Rather, these comparisons are made to establish the correlations between the 2 grading schemes in order to broaden current understanding of both programs and facilitate extrapolation of results between the 2 programs where necessary.

Guidelines for extrapolation between the 2 programs, recognizing the inherent limitations, would be desirable. It is important to note that the current study assessed only dogs 24 mo of age or older. The OVC-HCP performs certifications on dogs as young as 18 mo, and the OFA performs preliminary certification on dogs younger than 24 mo, but the comparison between results for dogs younger than 24 mo has not been evaluated here. The results of this study, therefore, cannot be applied to younger dogs. While the current study identified a minority of dogs that received a “pass” grade at the OFA and a “fail” grade from OVC-HCP, the McNemar’s test of bias was not significant indicating that there is no preferential direction to the disagreement between the OFA and the OVC-HCP. Neither program is more likely to pass or fail a given dog, and there is no bias or differential rate of pass or fail between the 2 programs that could be detected in this sample. However, based on the odds ratio, the odds of the OFA passing a dog that was failed by OVC-HCP is 5.3 X higher than the odds of a dog failing the OFA and passing the OVC-HCP assessment. Another important distinction between the 2 programs is that the OFA provides a grade within both passing and failing cases. This may be very useful for breeders, who could decide what level within a passing grade is acceptable for their own standards. For example, a dog receiving an OFA score of “fair” is considered to be a pass in the current project; however, many breeders would make the commitment that only dogs of good or excellent status are used for breeding. The provision of a grade of normalcy within the OFA system is likely an advantage over the OVC system, in which the radiologist makes a pass/fail distinction and a grade is only provided for the failures.

Among responsible breeders and veterinarians there is continued emphasis on the prevention of heritable diseases such as CHD through good breeding practices. The hip certification programs play a key role in providing accurate results about hip dysplasia and other heritable conditions with the common goal of improving the genetic health of dogs. The current study provides some validation of the repeatability of the OVC-HCP and offers some examples of how the grading schemes between the OVC-HCP and the OFA can differ, and demonstrates that results from 1 program consistently compare to the other without bias. The findings support that there is consistency within and between radiologists participating in the program and that where there is lack of agreement, this rarely results in a change in the pass/fail status of a dog. The needs of veterinarians and the breeding industry are best served by those programs which provide interpretation in an accurate and repeatable manner and the current work demonstrates that both programs are suitable for this purpose.

References

Book Review
Compte rendu de livre

Medical Mathematics and Dosage Calculations for Veterinary Professionals


When I saw this book title available for review, my curiosity was piqued as I wondered how medical mathematics for veterinary professionals alone could fill a grand 425-page, 10-chapter book. This is partly because a solid 170 pages of this book, chapters 1–5, painstakingly cover some of the most elementary mathematical concepts and techniques. These introductory chapters cover an initial self-assessment, followed by a review of decimal numbers, fractions, percentages, and solving for “x”.

On many occasions throughout the first half of this book, I found myself questioning how any veterinary professional could possibly get to this point in their career and need to review these sort of rudimentary mathematics. If you haven’t gained these basic math skills by this point, you need a lot more help than this book could ever offer. For example: “Add or subtract the following decimal numbers: 1.5 + 2 =”, “Simplify the following fractions: 4/16” and “Convert the following fractions to decimal numbers: 3/4”.

While I question the need for such an exhaustive review, these chapters are technically sound and thorough and provide a solid base for simple medical calculations to follow.

Chapter 6 leans towards more practical medical topics and discusses measurement units (metric versus non-metric) and simple dosage calculations. However, there is still a numbering 13 pages of how to convert body weights between pounds and kilograms, described in exhaustive detail using the “proportion method” versus the “cancel-out method”.

After that, things start to improve practically as the author begins to explore more clinically relevant topics. Chapter 7 moves away from mathematical calculating and explores drug orders (dose, route, and dose interval) and drug labels replete with a valuable “Best practices for writing drug orders” suggestion and how to handle unclear drug orders that all members of the veterinary team could benefit from reviewing. Although this chapter moves away from the underlying theme of the book, there are a variety of tidbits from this chapter that will be a good review for most veterinary professionals and some interesting gems that may be new to some.

Finally, in chapter 8, day-to-day, clinically relevant mathematical topics of dose calculation and syringe measurement are explored. These will cover many of the dose/dosage math basics used by doctors and technologists in everyday practice.

My interest, having worked in emergency small animal practice for several years, was supposed to be satisfied by chapter 9 which covers calculating intravenous infusions. I had expected this chapter to especially cover constant rate infusions and multiple-drug CRIs (e.g., MLK drips), but was disappointed to find that this wasn’t the case. The chapter thoroughly covers calculating drip rates using an IV administration set, an absolutely essential skill that all veterinary professionals should master. It then barely skim over calculating infusion rates when adding drugs to IV fluids, and does so mostly from a manual drip rate point of view. Next, the author explores the concept of “shock rates” and “shock doses” — a concept in the emergency and critical care world whose days are numbered as this concept has fallen out of favor and been replaced by small volume fluid resuscitation and goal-oriented end points of resuscitation.

Based on my disappointment in this chapter, the author would do himself well by spending time in his teaching hospital’s ICU prior to releasing the third edition of this book.

The last chapter cleans up some loose ends and covers the very important concept of dilutions in a very appropriate and easy to follow manner that may be helpful to many who have difficulty with this concept. There is then a quick review of converting temperature values (Celsius versus Fahrenheit), that would seem to be more appropriate in chapter 6 (measurement units) and an explanation of Roman numerals, also something that should be covered in earlier review chapters.

All chapters throughout the book provide various mathematical techniques, methods, shortcuts, and ways to simplify mathematics which may prove useful to some readers. Each chapter begins with very clearly stated objectives and, for the most part, each chapter meets these objectives. Every section within each chapter provides ample practice questions replete with an answer key. Each chapter concludes with additional practice problems but answers are not provided.

Overall, this is a mostly technically sound book with some important basic medical mathematics concepts. Although this book will be nowhere near a bestseller in the veterinary textbook category, it may be helpful to those who have struggled with math to this point in their career. On the negative side is the lack of CRI calculations, my concerns with “shock doses,” some minor typos and the occasional confusing statement that may turn off some mathematically challenged readers (e.g., “remember to convert the amount of drug per dose into the number of dose units per dose before determining the total dose units to be dispensed!”). I would find it hard to recommend this book (or justify the cost) to anyone who has a decent grasp of basic medical math skills and knowledge.

Reviewed by David Eisenbart, DVM, CARE Centre Animal Hospital, 7140–12th Street SE, Calgary, Alberta T2H 2Y4.

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Nutritional and microbial analysis of bully sticks and survey of opinions about pet treats

Lisa M. Freeman, Nicol Janecko, J. Scott Weese

Abstract — The objectives of this study were to measure the caloric density of bully sticks, to analyze the bully sticks for bacterial contamination, and to assess owner opinions about these and other pet treat products. Mean caloric density was 15 kcal/inch (38 kcal/cm) [range: 9 to 22 kcal/inch (23 to 56 kcal/cm), 2.96 to 3.07 kcal/g]. Of 26 bully sticks that were tested for bacterial contamination 1 (4%) was contaminated with Clostridium difficile, 1 was contaminated with methicillin-resistant Staphylococcus aureus (MRSA), and 1 with a tetracycline resistant Escherichia coli.

Résumé — Analyse nutritionnelle et microbienne des bâtonnets en peau de buffle et sondage d’opinion à propos des gâteries pour animaux de compagnie. Les objectifs de cette étude consistaient à mesurer la densité calorique des bâtonnets en peau de bovin, à analyser les bâtonnets en peau de bovin pour une contamination bactérienne et à évaluer les opinions des propriétaires à propos de ces gâteries et d’autres gâteries pour animaux de compagnie. La densité calorique moyenne était de 15 kcal/pouce (38 kcal/cm) [écart : de 9 à 22 kcal/pouce (de 23 à 56 kcal/cm), de 2.96 à 3.07 kcal/g]. Parmi les 26 bâtonnets en peau de bovin qui ont été testés pour une contamination bactérienne, 1 (4 %) était contaminé par Clostridium difficile, 1 était contaminé par Staphylococcus aureus résistant à la méthicilline (SARM) et 1 par Escherichia coli résistant à la tétracycline.

Introduction

Pet treats are a fast-growing segment of the pet food industry. There are many types of pet treats, including hard biscuits, soft treats, and edible manufactured bones. There is a wide variety of treats derived from parts of animals other than skeletal muscle. These include familiar products that have been on the market for many years, such as cattle hooves or skin (i.e., rawhide chews) and pig ears, but now range from lungs to tracheas to hearts. One treat for dogs is the bull or steer penis, commonly known as “bully” or “pizzle” sticks.

There are a number of potential concerns with bully sticks and other treats. One is as an additional source of calories. Obesity is a common problem in dogs and, in the authors’ clinical experience, most owners do not consider treats to contain a significant number of calories. Therefore, owners may be unknowingly providing additional calories to their dogs by feeding bully sticks.

Another possible concern for bully sticks and other similar treats is bacterial contamination. Outbreaks of human salmonellosis have been associated with contact with contaminated pig ears (contamination rates between 41% to 51%) (1–3). A more recent study showed that the prevalence of Salmonella contamination had decreased substantially to 4% but resistance remained a problem with isolates having resistance to 7 antimicrobials (4). Similar studies on bacterial contamination and resistance patterns have not been published for bully sticks. Furthermore, recent identification of emerging issues of community-associated Clostridium difficile and methicillin-resistant Staphylococcus aureus (MRSA) infection in humans (5–7) and identification of these pathogens in retail food products (8–12) raise the question of whether pet treats might be sources of exposure.

Finally, in the authors’ clinical experience, many pet owners and even veterinarians appear to be unaware of what pet treats are made of, particularly in the case of bully sticks. Understanding potential risks and owner perceptions about treats may enhance communication with dog owners. Therefore, the purpose of this study was to measure the caloric density of bully sticks and to analyze these products for bacterial contamination. In addition, a survey was performed to assess owner opinions about pet treats, including bully sticks.
Materials and methods

A convenience sample of 26 bully stick treats was purchased from retail outlets in the United States (n = 16) and Canada (n = 10). Although some of the treats were produced by the same manufacturers, all were different products (i.e., 26 different brands). A sample of each available bully stick product was purchased for each retail outlet visited to avoid selection bias.

Five 5- to 7-inch (13- to 18-cm) bully sticks purchased in the United States were randomly selected and submitted for proximate analysis at a commercial laboratory (Eurofins Scientific, Des Moines, Iowa, USA). Total length, diameter, and weight of each stick were recorded, and crude protein, crude fat, crude fiber, moisture, and ash were analyzed. Non-fiber carbohydrate was calculated (100-moisture-crude protein-crude fat-crude fiber-ash), and the kilocalories (kcal) per gram were calculated using modified Atwater factors on an as-fed basis (13). Using kcal/g, weight, and length, the kcal/treat and kcal/inch (kcal/cm) were calculated.

Microbiological testing was performed on all 26 treats. Treats were tested for the primary organism of interest (Salmonella spp.), but also for Clostridium difficile, MRSA, and generic Escherichia coli. Antimicrobial susceptibility testing of E. coli isolates was also performed.

A sample of approximately 10 g was inoculated into approximately 30 mL of C. difficile moxalactam norfloxacin (CDMN) broth (Oxoid, Nepean, Ontario) with 0.1% sodium taurocholate and incubated anaerobically at 37°C for 7 d. An aliquot of the broth was alcohol shocked with an equal volume of anhydrous ethanol for 1 h. This mixture was then centrifuged for 10 min at 3980 × g. The supernatant was discarded and the pellet was streaked onto a CDMN agar plate and incubated anaerobically at 37°C for 48 h. Suspicous colonies were subcultured onto blood agar and confirmed as C. difficile by colony morphology, Gram stain appearance, colony morphology, characteristic odor, and production of L-proline aminopeptidase.

A second sample of approximately 10 g was inoculated into 30 mL of enrichment broth consisting of 10 g tryptone/L, 75 g sodium chloride/L, 10 g mannitol/L, and 2.5 g of yeast extract/L. After 24 h incubation at 35°C, 5 to 10 μL of broth were inoculated onto MRSA chromogenic agar (Becton Dickinson, Franklin Lakes, New Jersey, USA). Plates were incubated at 35°C and read after 24 h and 48 h. Isolates were identified as S. aureus by colony morphology, Gram stain appearance, catalase reaction, coagulase reaction, and S. aureus latex agglutination test (Bio-Rad Laboratories, Mississauga, Ontario). Methicillin-resistance was confirmed by penicillin binding protein 2a latex agglutination test (Oxoid).

Salmonella and E. coli testing was performed following pre-enrichment of treats in buffered peptone water (BPW) at 37°C for 24 h. For Salmonella, 0.1 mL of the BPW mixture was inoculated into modified semi-solid Rappaport-Vassiliadis agar (Oxoid) and incubated at 42°C for 24-72 h. Presumptive colonies were plated on MacConkey agar (Becton Dickinson) and xylose lysine tergitol 4 agar (Oxoid) and incubated at 37°C for 24 h, and non-lactose fermenting colonies were inoculated on tryptic soy agar (Becton Dickinson). Biochemical testing was conducted using Christensen’s urea, triple sugar iron, and agglutination in Salmonella O antisera Poly A-I & Vi (all from Becton Dickinson).

For E. coli, 50 mL of the BPW mixture was combined with 50 mL of double strength E. coli broth (Becton Dickinson) and incubated at 37°C for 18 to 24 h. A loopful of rinse was plated on Eosin Methylene Blue agar (Becton Dickinson) and incubated at 37°C for 18 to 24 h. Presumptive E. coli colonies were transferred to MacConkey agar for purification and incubated at 37°C for 18 to 24 h. Isolated E. coli colonies were transferred onto tryptic soy agar plates and incubated at 37°C for 18 to 24 h. Confirmation testing of E. coli was conducted using Kovac’s indole spot reagent (Remel, Owatwa, Ontario) and Simmons’ citrate agar (Becton Dickinson). Antimicrobial susceptibility testing for E. coli isolates was conducted using an automated broth microdilution system (Sensititre, Trek Diagnostic Systems, East Grinstead, West Sussex, United Kingdom). The National Antimicrobial Resistance Monitoring System (NARMS) susceptibility panel CMV1AGNF was used with methods described by the Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS) (14,15). The breakpoints for resistance are those used by CIPARS and NARMS, which were derived from the Clinical and Laboratory Standards Institute (CLSI) where available (14,15). A lower breakpoint for ceftriaxone was used in this study, and is adapted from the CLSI Informational supplement M100-S20 (16).

For molecular typing, C. difficile isolates were typed by PCR ribotyping, as described elsewhere (17). When the ribotype was known to be a recognized international ribotype through previous typing of reference strains from the Public Health Laboratory Service Anaerobic Reference Unit, Cardiff, UK, the appropriate numerical designation (i.e., 078) was used. Otherwise, internal nomenclature was used. Genes encoding production of toxins A (tcdA) and B (tcdB) were evaluated using polymerase chain reaction (PCR) (18,19). Detection of CDT (binary toxin) was performed using PCR directed at tcdB, the binding component (20).

The MRSA isolates were typed by sequencing of the X region of the protein A gene (spa typing) (21) and classified using the Ridom system (22). Real-time PCR was used to detect the lukF and lukS Panton-Valentine leukocidin genes (23). Positive and negative controls were performed with each PCR run.

A 20-question Web-based survey was developed with the assistance of the Tufts University Office for Institutional Research and contained questions regarding the participant’s pet ownership, opinions regarding dog foods and treats, and participants’ background (survey available from the corresponding author upon request). Respondents were also asked to indicate if they were a veterinarian, veterinary technician, or dog breeder; this category is referred to as “professional category” hereafter. The study was reviewed and approved by Tufts University’s Institutional Review Board. The survey was posted online for public participation for 60 d. A survey was considered to be complete if ≥ 80% of the questions were answered. No incentive was offered for participation in the survey, and all responses were anonymous.
Data were examined graphically. Data are presented as mean ± standard deviation (SD) (normally distributed data) or median and range (skewed data). Results were compared by subcategories using Chi-squared analysis. Percent comparisons were calculated from the total survey respondents answering the individual question, unless otherwise stated. All analyses were performed using commercial statistical software (Systat 12.0; SPSS, Chicago, Illinois, USA).

## Results

Mean caloric density of the 5 bully sticks was 3.01 kcal/g (range: 2.96 to 3.07 kcal/g). Based on the variable length (mean = 5.71 ± 0.71 inches or 14.49 ± 1.80 cm) and diameter (mean = 2.17 ± 0.34 inches or 5.50 ± 0.86 cm), this resulted in a mean total caloric density of 88 kcal/treat (range: 45 to 133 kcal/treat) or 15 kcal/inch (range: 9 to 22 kcal/inch).

One of 26 samples (4%) was positive for *Clostridium difficile*. The isolate was a toxigenic strain with a ribotype pattern that has not been previously identified in the authors’ collection of isolates from animals, food, and humans. One other sample (4%) was positive for MRSA. The isolate was spa type 0111, a sequence type 398 (ST398) strain. Generic *E. coli* were isolated from 7 of 26 samples (27%). Of these 7 isolates, 1 was resistant to tetracycline and the other 6 were pan-susceptible to the antibiotics tested.

The survey was completed by 852 adults from 44 US states and 6 countries. Most respondents (791; 92.8%) were dog owners and female (738; 86.6%). Professional categories included veterinarians (n = 81), veterinary technicians (n = 66), and dog breeders (n = 112). Most respondents (n = 483; 57.2%) answered that ingredients were the most important factor when choosing a dog food. Other answers included recommendation from a veterinarian (n = 205; 24.3%), recommendation from a breeder (n = 60; 7.1%), the label says it is most appropriate for the individual dog/breed (n = 29; 3.4%), convenience (n = 29; 3.4%), price (n = 28; 3.3%), and recommendation from a pet store (n = 10; 1.2%). Respondents’ primary source of information for nutritional advice was the veterinarian (n = 381; 45.2%), the internet (n = 133; 15.8%), breeder/trainer (n = 95; 11.3%), books/magazines (n = 58; 6.9%), veterinary clinic staff (n = 47; 5.6%), friends/family (n = 42; 5.0), pet store staff (n = 18; 2.1%), and other (n = 68; 8.1%). A lower proportion of breeders (17%) reported that their primary source of information was the veterinarian compared with any of other professional categories (general respondents: 43%; veterinarians: 68%; veterinarians: 80%; P < 0.001).

For respondents who were dog owners (n = 791), the survey asked the type of food that composed the largest proportion of the diet and any foods that were included in the dogs’ diets. Most respondents fed dry food as the major component of the diet (663; 83.8%), but 85 (10.8%) fed either a commercial or homemade raw meat diet. Breeders were significantly more likely to feed a raw diet (either commercial or homemade; 23%) or a homemade diet (raw or cooked; 15%) compared with any of the other professional categories (P < 0.001). When asked about ingredients that they avoided in pet food, 454 (57.4%) avoided by-products, while 450 (56.9%) avoided preservatives and 295 (37.3%) avoided grains. Sixty-nine respondents (8.7%) listed other ingredients that they avoided which included artificial colors, beet pulp, chicken, beef, ingredients from China, soy, lamb, genetically modified organisms, garlic, wheat gluten, sugar, dairy, carbohydrates, cheese, chemicals, citric acid, and rosemary.

When asked what was contained in pet food by-products, most of the 773 respondents who answered this question (n = 674; 87.2%) answered correctly that internal organs were included (13). However, many also responded that ingredients that are specifically prohibited from by-products [Association of American Feed Control Officials (AAFCO) Feed Ingredient Definition 9.3 (13)] were included, such as hooves (466; 60.3%), horns (366; 47.4%), feces (167; 21.6%), road kill (103; 13.3%), and euthanized pets (99; 12.8%). Veterinarians and veterinary technicians were less likely than other professional categories (breeders and general respondents) to incorrectly respond that by-products contain these other items.

Two hundred forty-three dog owners (30.7%) fed rawhide chews to their dogs and 180 (22.8%) fed bully sticks. Of the respondents who fed bully sticks, 71% also stated that they avoided by-products. Four hundred eighteen of the 752 respondents for this question (55.6%) correctly identified that bully sticks were derived from bull penis but a variety of other responses also were provided (Table 1). Of the respondents who fed bully sticks, 28% did not correctly identify the source of bully sticks. While a higher proportion of veterinarians (62%) correctly identified the source of bully sticks compared to general respondents (44%; P = 0.006), 38% of veterinarians had incorrect responses to this question.

Calories in a 12” bully stick were underestimated by 50% of respondents. Fifty percent correctly answered 150 kcal but 38% answered 70 kcal, 9% answered 20 kcal, and 3% answered 0 kcal. Veterinarians had a higher rate of correct responses (62%) compared with all other professional categories. Potential risks of bully sticks were also questioned in the survey. The most frequent response from the 812 respondents on this question was that they can get stuck in the stomach or intestine (n = 697; 85.8%). Response rate to other potential risks included: they can be contaminated with bacteria (n = 477; 58.7%), they can break a dog’s teeth (n = 242; 29.8%), they can contain antibiotics (n = 106; 13.1%), and they have no risks (n = 34; 4.2%).

## Discussion

The number of calories measured in the 5 bully stick samples was similar on a weight basis. However, the length and width of bully sticks varies widely so total calories in an individual treat will vary accordingly. Nonetheless, the results show that bully sticks could provide between 54 to 132 kcal for a 6” bully stick.

### Table 1. Answers from 752 respondents to the question, “Which of the following is an accurate description of bully sticks?”

<table>
<thead>
<tr>
<th>Bully sticks</th>
<th>Total number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bull penis</td>
<td>418 (55.6%)</td>
</tr>
<tr>
<td>Cow tendon</td>
<td>154 (20.5%)</td>
</tr>
<tr>
<td>Cow muscle</td>
<td>47 (6.3%)</td>
</tr>
<tr>
<td>Rolled up sheep skin</td>
<td>8 (1.1%)</td>
</tr>
<tr>
<td>Didn’t know</td>
<td>115 (15.3%)</td>
</tr>
<tr>
<td>Other</td>
<td>10 (1.3%)</td>
</tr>
</tbody>
</table>
and 108 to 264 for a 12” bully stick. These calories may not be accounted for by the dog owner (50% of respondents in the current study underestimated the number of calories in bully sticks), especially if bully sticks are fed frequently. If the mean for a 6” bully stick were used (i.e., 90 kcal), 1 bully stick daily would be equivalent to 9% of the daily calorie requirements for a 50-pound (23-kg) dog and 30% of the daily calorie requirements for a 10-pound (4.5-kg) dog (24). With the high rate of obesity in dogs, veterinarians should be aware of bully sticks and other pet treats as a source of calories in a dog’s diet and should consider not only the dog food, but also pet treats and table food. Calorie information is currently not required on pet treats or on most pet foods so is not readily accessible for veterinarians and pet owners. The calorie information from the current study provides some information on calories in bully sticks.

The contamination rate in the current study [1 each (4%) contaminated with Clostridium difficile, MRSA, or tetracycline resistant E. coli] was relatively low but should be studied further to understand potential risks to pets and to human members of the household. Salmonella spp. were not isolated from any of the bully sticks in the current study but the low sample size may have limited the ability to detect a low rate of contamination. The human health relevance of contamination with C. difficile and MRSA is unknown. The C. difficile strain identified here has not been found in the authors’ collection of over 2000 human isolates; however, this does not exclude the possibility that it can cause disease. The MRSA strain that was identified is a livestock associated strain that is common in pigs internationally and is of concern in humans in some regions. Since human infection from handling Salmonella-contaminated treats can occur, it is plausible that bully sticks could be a source of infection. Additionally, bully sticks could be vehicles for MRSA colonization or extra-intestinal infection. Additional information is needed on the roles of processing, packaging, and cross-contamination in the safety of pet treats. Pet owners should be aware that these types of pet treats can be contaminated with bacteria and should follow standard recommendations when handling treats, particularly handwashing after contact with treats and ensuring that high risk individuals (very young, elderly, pregnant, immunocompromised) avoid all contact with raw animal-product based treats.

It appears from the survey results that many people have misconceptions about bully sticks, although bully sticks were fed to the dogs of 23% of respondents. Seventy-one percent of people feeding bully sticks also stated that they avoided by-products in pet foods and 28% did not correctly identify what bully sticks were made of. Manufacturers of bully sticks are not required to state that bully sticks are derived from bull/steer penis, and often list the ingredients as “bull pizzle” or even misleadingly as “cow muscle.” While veterinarians had a higher rate of correct responses for the source of bully sticks, 38% of veterinarians incorrectly identified them. This suggests that both veterinarians and pet owners would benefit from increased awareness about the source of bully sticks so that they can make informed purchasing and feeding decisions.

Veterinarians were the most commonly reported primary source of information about nutrition so this offers an important opportunity to provide objective and accurate information. For example, a large proportion of respondents (57%) stated that they avoided by-products in pet foods, but most incorrectly identified ingredients that comprise by-products. Providing accurate information on nutrition and pet foods can assist owners in making more informed decisions about their pet’s food. While veterinarians or veterinary clinic staff were the primary source of information for many respondents, the primary resources for other respondents (e.g., the internet) may provide less reliable information on nutrition and pet foods.

There are a number of limitations to the current study. Studies with a larger sample size are warranted to determine whether the calorie content and contamination rate found in this small study is representative of all bully sticks (or even other types of pet treats). While using an online survey allowed for a relatively large pool of respondents, respondents were primarily recruited through e-mail and other electronic techniques, limiting the respondents to individuals with computer and internet access. Also, there may have been bias in the respondents, as those who chose to respond to the survey may have had a stronger opinion about dog foods and treats. Similarly, a larger proportion of respondents were dog owners, which may have contributed to bias. In addition, there was no way to prevent individuals taking the survey from checking answers to the factual questions (e.g., what are bully sticks made from?) so it is not possible to know whether these questions accurately assessed the respondents’ knowledge before taking the survey. These limitations may reduce the relevance of the results for other populations. Veterinarians and pet owners, however, should be aware of the high calorie content and potential for bacterial contamination of bully sticks.

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**References**

Self-Assessment Color Review: Feline Infectious Diseases


The Self-Assessment Color Review series is comprised of books in various areas of veterinary medicine that use a case-based approach. This volume presents an overview of feline infectious diseases written as 199 short illustrated cases. The description of each case is given in a paragraph or two and is followed by a few questions. Cases are illustrated with one or two images that may show clinical lesions, radiographs, photomicrographs, histology sections, etc. The detailed answer for each set of questions is found by turning the page, making it convenient to read through the cases and test one’s knowledge. For example, a case of *Otodectes cynotis* infection is presented with a signalment and history as well as photos of the skin lesions and the mites. The reader is then asked questions such as how the infection is transmitted and what treatment options are available. The cases include a variety of feline infectious diseases — viral, bacterial, fungal, and parasitic. The editors and their 13 international contributors use a practice-oriented approach to presenting the cases, closely approximating the way such diseases would appear in clinical practice, thus reinforcing clinical skills. The front of the book shows the cases classified by organ system or type of infection, making it easy to find cases in particular subject areas. Finally, the book also contains a table of normal reference ranges for physical examination findings, complete blood count, coagulation and biochemistry panels, and urinalysis.

This book would be most useful to veterinary students in clinical rotations, but also valuable for clinicians who wish to review and improve their knowledge of feline infectious diseases. The book would also be useful for clinicians studying for further qualifications. The short case format and accessible style make it easy to pick up the book, browse and view cases, and learn a few new facts in the space of a few minutes free time.

Reviewed by Susan Little, DVM, Dip ABVP (Feline), Bytown Cat Hospital, Ottawa, Ontario.
Case Report  Rapport de cas

Cerebellar granuloprival degeneration in an Australian kelpie and a Labrador retriever dog

Jonathan Huska, Luis Gaitero, Heindrich N. Snyman, Robert A. Foster, Marti Pumarola, Sergio Rodenas

Abstract — A 7-month-old Australian kelpie dog and a 14-month-old Labrador retriever dog were diagnosed with an uncommon form of cerebellar abiotrophy called cerebellar granuloprival degeneration. This was characterized by a loss of the granular neurons with relative sparing of the Purkinje neurons.

Résumé — Dégénérescence cérébelleuse granuloprive chez un chien Kelpie australien et un chien Labrador retriever. Un chien Kelpie australien âgé de 7 mois et un chien Labrador retriever âgé de 14 mois ont été diagnostiqués avec une forme rare d’abiotrophie cérébelleuse appelée dégénérescence cérébelleuse granuloprive. Elle a été caractérisée par la perte de neurones granulaires en épargnant en grande partie les neurones de Purkinje.

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Cerebellar abiotrophy (CA) is defined as the premature degeneration of formed cerebellar tissue, representing an intrinsic metabolic anomaly that results in progressive signs of cerebellar dysfunction (1). Cerebellar cortical degeneration (CCD) is a synonymous term more recently introduced to reflect the inability to completely rule out effects of extrinsic factors leading to degenerative changes. In dogs, CA/CCD has been widely described in the following breeds: kerry blue terrier (2,3), Gordon setter (4,5), old English sheepdog (6), Australian kelpie (7–9), American Staffordshire terrier (10–12), English bulldog (13), Scottish terrier (14,15), Labrador retriever (16,17), boxer (18), Rhodesian ridgeback (19), and the miniature schnauzer (20).

While a neonatal form has been described, for instance in the beagle (21), most cases of CA/CCD are postnatal with affected animals being normal at birth and clinical signs occurring early in life (< 6 mo of age) or late in adulthood (late-onset) with varying rates of progression. An autosomal recessive pattern of inheritance is usually suspected (1,2,4,6,7,11,22).

The most frequently reported form of CA/CCD is characterized by a loss of Purkinje cell neurons, often with retrograde degeneration of the granular cells (23). However, loss of the granular cell layer with relative sparing of Purkinje cells, called cerebellar granuloprival degeneration, has been sporadically reported in dogs (9,22,24–28).

This article describes 2 cases of histopathologically confirmed cerebellar granuloprival degeneration in an Australian kelpie dog and a Labrador retriever dog.

Case descriptions

Case 1
A 7-month-old, female intact, Australian kelpie dog (Case 1) was presented to the Neurology Service of the Ontario Veterinary College Health Science Center (OVC-HSC) due to progressive ataxia and abnormal behavior. Clinical signs began at 6 wk of age with wide, lateral excursions of the head that progressed to dysmetria, intermittent circling to the right, intention head tremors, and compulsive behavior (licking and fly biting). No traumatic episode was noted nor was there any known exposure to toxins. At 11 and 14 wk of age neurological examination revealed an absent menace response with the left eye, and intention head tremors. Galactocerebroside activity analysis was performed on whole blood for suspected globoid cell leukodystrophy and results were within normal reference range (0.9 nmol/h/mg protein). Toxoplasma gondii (IgG immunofluorescent test) and Neospora caninum enzyme-linked immunosorbent assay (ELISA) serum titers were negative.
On presentation at the OVC-HSC, the results of a general examination were unremarkable. Neurological examination revealed wide lateral head excursions, circling to the left and right sides, intention head tremors, hypermetria in all 4 limbs, and decreased menace response with the left eye. The results of the rest of the neurological examination were unremarkable. Neuroanatomical localization was mostly consistent with a cerebellar lesion. The episodic compulsive behavior reported by the owners suggested involvement of the thalamocortex (limbic system), although it was uncertain if this was an unrelated behavioral non-neurological dysfunction. Further diagnostics were declined by the client. The patient was presented again 1 mo later due to progression of the described clinical signs including a bilateral menace response deficit. At that time, the owner opted for euthanasia. A postmortem examination was performed.

At postmortem examination, there was a subtle dorsoventral flattening of the cerebellum and cerebrum, both of which conformed to the shape of the cranial vault (Figure 1). This suggested that the calvarium and central nervous system developed simultaneously and sequentially. The brain was otherwise unremarkable. The brain was fixed in 10% neutral-buffered formalin, sectioned and embedded in paraffin wax. The cerebellum was sectioned midsagittally through the vermis, followed by bilateral transverse sections in order to evaluate the respective cerebellar lobes. Tissue sections were stained with hematoxylin and eosin (H&E), periodic acid Schiff (PAS), and Luxol fast blue (LFB-Holmes) for histological evaluation.

Microscopically, all cerebellar folia were small and had wide cerebellar sulci. There was an extensive and bilaterally asymmetrical thinning of all the cerebellar cortex, including the granular, Purkinje, and molecular layers, such that the cortex ranged from 340 to 500 μm thick; normal thickness should be approximately 650 μm at the end of cerebellar development (29). The thickness of the granular layer varied from 47 μm at its thinnest point to 180 μm at its widest; normal thickness is approximately 200 μm (29). There was marked hypocellularity of especially the granular layer, and also a marked reduction in the number of granule neurons, Golgi cells, Purkinje neuron axons, and myelinated fibers of the white matter (Figure 2). The remaining granule cells were loosely arranged and cell nuclei of the granular layer in these areas were small and condensed with euchromatic chromatin. Purkinje cells were tightly packed with approximately 9 Purkinje neuronal cell bodies present in a 350 μm length of the Purkinje cell layer as opposed to 4 Purkinje neuronal cell bodies in an age matched normal cerebellum, suggesting collapse of the neuropil. There were randomly scattered groups of individual empty Purkinje cell baskets (empty baskets) suggesting that about 30% of Purkinje cells were missing. Varied stages of cellular degeneration of the remaining Purkinje cells were identified, including central chromatolysis, karyolysis, and pyknosis of nuclei, affecting approximately 40% of the remaining Purkinje cells (Figure 2B). Their cytoplasm commonly contained irregular, pale, homogenous and glassy, basophilic material and often had overlying clear microvesicular vacuolization. Astrocytic processes surrounding empty baskets were accentuated with a glial fibrillary acidic protein (GFAP) immunohistochemical (IHC) stain (Figure 2C). Baskets were occasionally filled with small numbers of hypertrophic plump astrocytes with large vesicular nuclei (Bergmann's glia proliferation). Rare randomly scattered, small, 15 × 20 μm, angular polygonal neuronal cell bodies, with small amounts of amorphophilic, finely granular cytoplasm, and large, round nuclei with euchromatic chromatin and a single prominent nucleolus were present within the granular and rarely molecular layer of the cerebellar cortex (Figure 2D). Although those were interpreted as Golgi cells (appeared to be more prominent due to the granular cell depletion), they could not definitively be differentiated from Purkinje cells without the use of immunohistochemistry. No changes were observed in the cerebellar nuclei, cerebellar peduncles, pontine nuclei, vestibular nuclei, olivary nuclei, spinocerebellar tracts, or the limbic system. Staining with PAS and LFB-Holmes did not identify any further abnormalities. Microscopic findings were consistent with cerebellar granuloprival degeneration.

**Case 2**

A 14-month-old, spayed female, Labrador retriever dog was presented to the Neurology Service of the Southern Counties Veterinary Specialists due to a 4-week history of progressive lack of coordination involving all 4 limbs. The owner reported that the dog initially exhibited pelvic limb ataxia which progressed to the thoracic limbs after approximately 1 wk. No traumatic episode was noted nor was there any known exposure to toxins. On initial presentation, the results of a general physical examination were unremarkable. Neurological examination revealed a wide-based stance in the thoracic limbs, intermittent swaying of the body from side to side, moderate spasticity and hypermetric ataxia of all 4 limbs (worse in the pelvic limbs), fine intention tremors of the head, and decreased menace responses bilaterally. The results of the remainder of the neurological examination were normal. The neuroanatomical localization was consistent with a cerebellar lesion.

Complete blood (cell) count, serum biochemistry profile, urinalysis, and thoracic radiographs were unremarkable. A magnetic resonance imaging (MRI) study of the brain was performed (Philips Intera 1.0 T; Philips Healthcare, Guildford,
Routine T1-weighted and T2-weighted sequences in sagittal, transverse, and dorsal planes were obtained (3-mm slice thickness) and revealed an increase in the amount of cerebrospinal fluid (CSF) between the folia around the cerebellum due to thinner cerebellar folia and wider sulci, suggesting cerebellar cortical atrophy. Those changes were particularly evident on sagittal T2-weighted images (Figure 3). Cerebrospinal fluid (CSF) analysis did not reveal abnormalities (0 nucleated cells/μL, reference range: 0 to 3 nucleated cells/μL; total protein concentration: 0.17 g/L; reference value: < 0.3 g/L). Polymerase chain reaction (PCR) for *Neospora caninum*, canine distemper virus, and *Toxoplasma gondii* were negative on both blood and CSF samples. A presumptive diagnosis of CA/CCD was made.

The dog was presented 4 mo later due to worsening of the clinical signs. At that time, the animal had severe generalized ataxia; the dog was still able to walk but fell down or collapsed frequently. Due to the guarded prognosis the owners opted for euthanasia and postmortem examination.

At the postmortem examination, the cerebellum appeared small with wide cerebellar cortical sulci. The brain was otherwise unremarkable. The brain was fixed in 10% neutral-buffered formalin, then sectioned and embedded in paraffin wax. Tissue sections were stained with H&E, and PAS for histological evaluation. Microscopic examination revealed a generalized and marked loss of granule neurons, affecting mainly the vermis, and with a minor intensity, the cerebellar hemispheres (Figures 4A–C). Few Golgi neurons were observed in the sparse granular layer without showing any morphological change. The Purkinje cell layer had a mild decrease in cell number, showing focal clusters of these neurons and several empty baskets. Most of the Purkinje cells showed central chromatolysis. Spheroids corresponding to axons of Purkinje cells were detected in the sparse granular layer. Bergman’s glia proliferation and hypertrophy were also present (Figure 4C). A mild spongiosis of the white matter was observed affecting mainly cerebellum and cerebellar peduncles. No changes were observed in the cerebellar nuclei, pontine nuclei, and spinocerebellar tracts. Eosinophilic, PAS-positive, granular material was detected in some of the remaining cerebellar granular neurons and also in the perikarya of neurons of vestibular and olivary nuclei in a...
bilateral and symmetrical pattern (Figure 4D). Based on those findings, cerebellar granuloprival degeneration was diagnosed.

Discussion

The clinical signs in both patients, including the loss of menace response in case 1, were attributed to cerebellar disease classified as CA/CCD. Although loss of the Purkinje cell neurons is the most commonly described form of CA/CCD, another form called cerebellar granuloprival degeneration characterized by a specific degeneration of the granular cell neurons while sparing the Purkinje cells has been sporadically reported in several canine breeds: border collie (22), Brittany spaniel (24), Italian hound (25), coton de Tulear (26), lagotto Romagnolo (27), Bavarian mountain dog (28), and, recently, the Australian kelpie (9). Other degenerative changes affecting cerebellar and related brainstem nuclei, such as neuronal eosinophilic granules, have also been described in some of those cases (15,24,26).

A report of 3 Labrador retriever puppies from the same litter as the dog herein (16) described histological findings of a predominantly Purkinje neuron degeneration throughout the entire cerebellum, with the rostral vermis most severely affected. The onset of clinical signs ranged from 9 to 17 wk of age with rapid deterioration, in contrast to the slow progression of clinical signs observed in an 8-month-old Labrador retriever with comparable selective degeneration of Purkinje cells (17). Those findings are in contrast to our cases in which sparing of the Purkinje cell layer and specific degeneration of the granular cells was diagnosed, thus representing the first report of this cerebellar granuloprival degeneration form of CA/CCD in the Labrador retriever.

Thomas and Robertson (7) described the findings in 5 Australian kelpie littermates with clinical signs of progressive ataxia, hypermetria, and head tremors beginning between 5 to 12 wk of age. Histopathologically, the more common CA/CCD form with loss of Purkinje cells and varying degrees of reduction in the granular cell layer was diagnosed in those affected puppies between 8 wk and 5.5 mo of age. However, recent findings suggest that the granuloprival form occurs in Australian kelpies as well, particularly in young individuals (9). Those authors suggested that Purkinje cells are lost in more severe, long-surviving dogs with more pronounced cerebellar changes secondary to the granule cell depletion since granule neurons are facilitatory to Purkinje cells. Preservation of Purkinje cells, therefore, could be found in younger puppies and depletion of both cell groups would be evident in older dogs. Nevertheless, the first description of the CA/CCD in the Australian kelpie (7) included young puppies (8 wk of age) in which regional loss of Purkinje cells was detected. This suggests that both forms coexist in the Australian kelpie, though the incidence of each one remains to be investigated as well as the potential for different underlying etiologies.

The reason for a selective depletion of granular cells still needs to be elucidated. It is hypothesized that cerebellar granuloprival degeneration is usually the result of an inherited disturbance of granular cell development, but Purkinje cells survive retrograde degeneration since their major excitatory input is received from the climbing fibers coming from the olivary nucleus (1,24,28). However, the granular neurons are considered facilitatory to Purkinje cells as well, and some authors have suggested that Purkinje cells can be lost as result of granular cell depletion in longer-affected individuals (9).

Inflammatory-infectious etiologies should be considered, although unlikely in our cases due to the lack of evidence of inflammation. Inflammatory foci were found in coton de Tulear dogs and a genetically based immune-mediated granule cell destruction pathophysiology was proposed (26). Canine herpes virus infection has been reported to cause similar reduction of the granular cell layer but with associated loss of Purkinje cells and foci of infiltrating mononuclear cells and malacia (30). Intrauterine or perinatal infection with feline parvovirus (panleukopenia virus) in cats can cause hypoplasia of the granular cell layer resulting in clinical signs of cerebellar dysfunction (31,32). Canine parvovirus has been identified in dogs with cerebellar hypoplasia but not with CA/CCD (33). None of these features were present in our 2 cases, showing changes more consistent with previous reports of a suspected non-inflammatory probably inherited process (24,25,28).

A definitive diagnosis of CA/CCD requires histopathological confirmation. Nevertheless, CA/CCD can be suspected when other differential diagnoses have been ruled out (as intracranial neoplasia, encephalitis, or toxicities) and supported by the MRI findings. Although MRI images can be absolutely normal, abnormalities could be particularly detected in mid-sagittal T2-weighted sequences, characterized by a decreased cerebellar size and a reduced thickness of the cerebellar folia associated with an increased amount of CSF in the sulci (11,12,14,28,34).

Interestingly, seizures were reported in 1 of the Australian kelpie puppies included by Thomas and Robertson (7), although a more extended description of the episodes was missing. The episodic compulsive behavior reported by the owners in Case 1 herein could certainly be a seizure. However, on the postmortem examination no abnormal histopathological findings were detected in either case in the cerebrum and it is uncertain if those episodes were truly an epileptic seizure. Interestingly, behavioral changes, including lack of confidence and aggression
towards other dogs in the household, were reported by owners in 2 of the 63 dogs included in a retrospective study on CCD in the American Staffordshire terrier (11). Although neuronal death was restricted to the cerebellar cortex in those dogs, in 1 dog MRI was suggestive of cerebral atrophy. Those authors noted that cognitive deficits and a more diffusely neuronal loss can occur in humans with adult-onset spinocerebellar ataxia (the suggested human counterpart for CCD in the American Staffordshire terrier).

Given the paucity of literature with histological descriptions of CA/CCD in the Australian kelpie and Labrador retriever, these 2 cases could represent a subclass of the disease or be a completely different form for these breeds. While the previously reported CA/CCD cases in the Australian kelpie are consistent with an autosomal recessive pattern of inheritance (7), no pedigree analysis was available for this case, though the bitch and sire were believed to be clinically normal.

A recent study identified the mutation causing CA/CCD in American Staffordshire terriers, confirming that CA/CCD in this breed represents a model of a late-onset form of neuronal ceroid lipofuscinosis, a neurodegenerative lysosomal disorder (35). In the Australian kelpie, 3 candidate genes have been eliminated (8); a more recent study identified a candidate region containing 29 genes, although none of them are known to cause ataxia (9).

To the authors’ knowledge, this is the first report of a granuloprival form of cerebellar cortical degeneration in the Labrador retriever, and the first case reported in an Australian kelpie in North America. With the search for causative mutations, either for screening purposes or targets for future gene therapy, the exact histological classification will be necessary to ensure accuracy as the mutation responsible for cerebellar granuloprival degeneration might differ from that which causes CA/CCD, primarily affecting the Purkinje cell layer.

References

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Case Report  

Acute renal failure in 2 adult llamas after exposure to Oak trees (Quercus spp.)

Manuel F. Chamorro, Thomas Passler, Kellye Joiner, Robert H. Poppenga, Jenna Bayne, Paul H. Walz

Abstract — Two adult llamas (Lama glama) previously exposed to oak trees (Quercus spp.) were presented with a history of depression and anorexia. Clinicopathological abnormalities included severe gastroenteritis, acute renal failure, and increased liver enzymes. This is believed to be the first report of oak toxicosis in South American camelids.

Résumé — Insuffisance rénale aiguë chez deux lamas adultes après l’exposition à des chênes (Quercus spp.). Deux lamas adultes (Lama glama) antérieurement exposés aux chênes (Quercus spp.) ont été présentés avec une anamnèse de dépression et d’anorexie. Les anomalies clinicopatologiques incluient une gastroentérite grave, une insuffisance rénale aiguë et une hausse des enzymes hépatiques. On croit qu’il s’agit du premier rapport sur la toxicose du chêne chez des camélidés d’Amérique du Sud.


Renal damage and gastroenteritis are reported in cattle after ingestion of leaves, buds, and acorns from Oak trees (Quercus spp.) (1); however, oak toxicosis is not reported in South American camelids. Hydrolysable tannins and volatile phenols in oak leaves, buds, and acorns are responsible for the clinical signs observed (2,3). Hydrolysis of gallotannins into gallic acid occurs in the rumen, thus ruminants are most frequently affected by oak toxicity (3,4). This case report describes findings of 2 adult llamas (Lama glama) with presumptive oak toxicosis. Both llamas were presented with a history of exposure to oak trees and had developed gastroenteritis and acute renal failure. Early and aggressive long-term intravenous fluid therapy was associated with a favorable outcome in 1 of these cases.

Case descriptions

Case 1
Case #1 involved a 150-kg, 6-year-old male, castrated llama presented to Auburn University Large Animal Teaching Hospital (AULATH) for anorexia and diarrhea of 5 d duration. During the previous month, the llama was kept in a 0.8 ha wooded paddock with a female llama, which remained unaffected. The animals received free-choice Bermuda grass hay and ad libitum water, but grain or mineral supplements were not provided. The owner reported that the llamas had been browsing on oak trees. The llama had not received any treatments at the farm and had not been dewormed or vaccinated in the last year.

On arrival, the llama was depressed and in sternal recumbency. Rectal temperature was elevated at 39.6°C [reference range (RR): 37.5°C to 38.9°C] (5), heart rate 94 beats/min (bpm), RR: 60 to 90 bpm (5), and the respiratory rate was elevated at 84 breaths/min (RR: 10 to 30 breaths/min) (5). Dehydration was estimated at 8%. Body condition score was 5/9. Multiple ulcerative lesions on the tongue and soft palate were identified during oral examination, and the exhaled air had a urine-like odor. Compartment 1 contractions were absent and intestinal motility was decreased. The perineum was stained with feces. Abdominal ultrasound revealed slight dilation of the renal calyces and moderate bilateral perirenal edema. A free-catch urine sample had a specific gravity of 1.010. A complete blood (cell) count (CBC) indicated leukocytosis (26.49 × 10³/μL; RR: 8.0 to 21.4 × 10³/μL) (5), with neutrophilia (23.57 × 10³/μL; RR: 4.7 to 14.8 × 10³/μL) (5), left shift (bands 1.3 × 10³/μL; RR: 0 to 1.047 × 10³/μL) (5), and hyperfibrinogenemia (20.6 μmol/L; RR: 2.9 to 14.7 μmol/L) (5). Serum chemistry analysis showed severe azotemia [blood urea nitrogen (BUN) 105.0 mmol/L; RR: 3.2 to 12.8 mmol/L; creatinine 2891 μmol/L; RR: 79.6 to 247.5 μmol/L] (5), hypermagnesemia (1.8 mmol/L; RR: 0.8 to 1.4 mmol/L) (5), and hyperkalemia (6.6 mmol/L; RR: 3.6 to 6.2 mmol/L) (5). Metabolic acidosis (bicarbonate 11.5 mmol/L; RR: 19 to 31 mmol/L) (5), increased anion gap (55 mmol/L; RR: 14 to 20 mmol/L), increased liver enzymes [sorbitol dehydrogenase
Case #2 involved a 120-kg 9-year-old, male intact llama presented to the Veterinary Teaching Hospital of the University of California, Davis, for depression, anorexia, and production suppression. The llama had been moved to the farm during the previous month, and the grass had been scarce and oak trees were present in the pasture. The llama had not been vaccinated or dewormed for 1 month, and the owner stated that the llama appeared to drink normal quantities of water from a trough, and he had treated the llama with mineral oil (Butler Schein Animal Health, Union, New Jersey, USA), IV for 2 d and had administered 2 rectal enemas with mineral oil (Butler Schein Animal Health, Union, New Jersey, USA) at unknown doses. The llama had been moved to the farm during the previous month and was placed on a mixed-grass pasture with a male goat that remained unaffected. The owner reported that during the last month, the grass had been scarce and that oak trees were present in the pasture. The llama had not been vaccinated or dewormed by the owner.

The llama was mildly depressed on presentation. The heart rate was 90 bpm, respiratory rate 44 breaths/min, and temperature 37.6°C. Dehydration was estimated at 6%. Body condition score was 4/9. Gastric compartment 1 contractions were absent and intestinal motility was decreased. During examination of the oral cavity, severe halitosis was noted. An episode of diarrhea with blood clots and some formed fecal pellets was observed during initial examination. Ultrasound examination of thoracic and abdominal cavities, including both kidneys, was unremarkable. A CBC showed that there was leukopenia (6.55 × 10^3/μL) with neutropenia (4.31 × 10^3/μL), left shift (bands 0.261 × 10^3/μL), and hyperfibrinogenemia (23.5 μmol/L). Serum chemistry analysis demonstrated severe azotemia (BUN 101.0 mmol/L; creatinine 3085 μmol/L), hypernatremia (140 mmol/L; RR: 148 to 158 mmol/L), hypokalemia (2.6 mmol/L), hypochloremia (83 mmol/L), hypocalcemia (1.8 mmol/L; RR: 2.0 to 2.6 mmol/L), and hyperglycemia (12.3 mmol/L; RR: 4.2 to 9.8 mmol/L). Metabolic acidosis (bicarbonate 12.4 mmol/L), increased anion gap (47.2 mmol/L), and increased liver enzymes [SDH 16.4 U/L; AST 561 U/L; RR: 127 to 420 U/L] (5), and creatine kinase (CK) 1889 U/L; RR: 14 to 238 U/L, (5) were detected.

Initial fluid therapy included a 1.3% sodium bicarbonate solution (Hospira, Lake Forest, Illinois, USA), in combination with polyionic crystalloids (Plasmalyte; Abbott Laboratories, Chicago, Illinois, USA), 100 mL/kg body weight (BW) per day, IV in order to promote diuresis and correct acid base and electrolyte abnormalities. Additional therapy included ceftriaxone sodium (Naxcel; Pfizer Animal Health, New York, New York, USA), 4.4 mg/kg BW, IV, q12h. Ice packs were placed under the abdomen and axilla to treat hyperthermia. After 20 h of therapy, the llama’s rectal temperature returned to normal (38.6°C) but the animal continued to be depressed, in sternal recumbency, and did not urinate again. The llama died after 22 h of treatment.

At necropsy, multiple oak leaf fragments were interspersed among the ingesta in gastric compartments 1, 2, and 3. Multiple areas of hyperemia were detected throughout the gastric mucosa. Moderate perirenal edema was present bilaterally, and the kidneys were swollen, wet, pale, and soft. No other gross lesions were observed. Histologic examination of the kidneys revealed multifocal, acute tubular degeneration and necrosis, with tubular epithelial regeneration (Figure 1). Degenerating tubules were lined by discontinuous epithelium with sloughing into the tubular lumens. Other non-specific histologic changes included gastric mucosal congestion, vacuolar hepatocellular degeneration, and pulmonary congestion. Samples of urine and kidney tissue were submitted for gas chromatography-mass spectrometry (GC/MS) detection of pyrogallol, a degradation product of gallic acid [California Animal Health & Food Safety Laboratory (CAHFSL), Davis, California, USA]; however, all samples were below the pyrogallol detection level (5 ppm).

**Case 2**

Case #2 involved a 120-kg 9-year-old, male intact llama presented to AULATH for anorexia, depression, and production of scant amounts of dry bloody feces over a 5-day period. The owner stated that the llama appeared to drink normal quantities of water from a trough, and he had treated the llama with 100 mg flunixin meglumine (Banamine; Schering-Plough Animal Health, Dublin, Ohio, USA) at unknown doses. Furosemide (Salix; Intervet, Millsboro, Delaware, USA), 4.4 mg/kg BW, IV, q12h, and ceftriaxone sodium (Naxcel; Pfizer Animal Health), 2 mg/kg BW, IV, q8h, ranitidine (Zantac; GlaxoSmithKline, Research Triangle Park, North Carolina, USA), 1.5 mg/kg BW, IV, q8h, and ceftriaxone sodium (Naxcel; Pfizer Animal Health), 4.4 mg/kg BW, IV, q12h were also given. After 24 h of treatment, hydration appeared normal, and the llama appeared brighter and was urinating, but diarrhea and anorexia continued. At 24 h of hospitalization, liver enzymes, sodium, and bicarbonate concentrations were normal; however, hypochloremia (85 mmol/L), hypokalemia (3.1 mmol/L), increased anion gap (31.3 mmol/L), and azotemia (BUN 88.5 mmol/L; creatinine (CAHFSL), Davis, California, USA) below the pyrogallol detection level (5 ppm). Fecal evaluation for parasites revealed 500 eggs/g trychostrongylus.

Intravenous fluid therapy was initiated using 1.3% sodium bicarbonate solution with potassium chloride, 20 mEq/L (Hospira) at 100 mL/kg BW per day during the first 24 h to correct dehydration, electrolyte abnormalities, and metabolic acidosis. Furosemide (Salix; Intervet, Millsboro, Delaware, USA), 2 mg/kg BW, IV, q8h, ranitidine (Zantac; GlaxoSmithKline, Research Triangle Park, North Carolina, USA), 1.5 mg/kg BW, IV, q8h, and ceftriaxone sodium (Naxcel; Pfizer Animal Health), 4.4 mg/kg BW, IV, q12h were also given. After 24 h of treatment, hydration appeared normal, and the llama appeared brighter and was urinating, but diarrhea and anorexia continued. At 24 h of hospitalization, liver enzymes, sodium, and bicarbonate concentrations were normal; however, hypochloremia (85 mmol/L), hypokalemia (3.1 mmol/L), increased anion gap (31.3 mmol/L), and azotemia (BUN 88.5 mmol/L; creatinine...
2714 μmol/L) were still present. Ranitidine, furosemide, sodium ceftiofur, and isotonic saline containing potassium chloride (20 mEq/L) at a rate of 100 mL/kg BW per day were continued. Forty-eight hours after hospitalization, the llama was bright and responsive, urination frequency was normal, and feces were more formed and still covered with mucus and blood. The llama was still anorectic and C1 motility was absent. A third serum chemistry panel demonstrated normokalemia, hypocloremia (88 mmol/L), increased anion gap (30.3 mmol/L), and severe azotemia (BUN 71.8 mmol/L; creatinine 1830 μmol/L). Urinalysis revealed a urine specific gravity of 1.010 with no other remarkable findings. Potassium chloride administration was suspended and ruminal fluid (2 L) obtained from a donor cow was administered via orogastric tube q24h for 3 d. The rest of the therapeutic plan remained the same. On day 4 of hospitalization and during the next 8 d the llama progressively started to eat hay and drink water. The llama recovered forestomach motility, urination continued to be normal, but unformed feces covered with blood clots were still present. Fluid therapy was continued. At day 10 of hospitalization, serum chemistry demonstrated normal serum electrolyte values. A considerable decrease in the concentrations of BUN and creatinine was also observed (BUN 42.6 mmol/L; creatinine 1070 μmol/L). Since the llama was eating, drinking, and urinating normally, ranitidine, furosemide, and antibiotics were discontinued. Intravenous fluid therapy was continued using an isotonic crystalloid solution (Plasmalyte; Abbot Laboratories) at 75 mL/kg BW per day.

During the next 20 d, the llama remained alert, responsive, eating and drinking normally. Urination was normal and feces were free of blood and recovered their normal consistency. Considerable decreases in BUN and creatinine values ranging from 27.4 to 4.6 mmol/L and 778 to 389 μmol/L, respectively, were observed. Urine specific gravity at this time varied from 1.009 to 1.023. Intravenous fluid therapy was decreased to 60 mL/kg BW per day on day 15 and was terminated at day 30 of hospitalization. The llama kept eating, drinking, urinating, and defecating normally. Values of BUN and creatinine after termination of IV fluids ranged from 5.6 to 5.5 mmol/L and 442 to 407 μmol/L, respectively. Urine specific gravity varied between 1.018 and 1.030. At day 45 of hospitalization, the llama was discharged from the hospital with instructions for a low protein diet and adequate mineral and forage supplementation. One month after discharge, the llama was still doing well and levels of serum BUN and creatinine were within reference ranges.

Discussion

Acute renal failure in large animals usually results from hemodynamic changes in renal perfusion (hyperperfusion or ischemia) or from exposure to nephrotoxic agents (4). In this report, acute renal failure is described in 2 llamas that had pasture access to oak trees. At initial presentation, both llamas were depressed, anorectic, and had history of constipation followed by diarrhea. These signs are nonspecific and commonly observed in sick camelids (6–8). Initial clinical signs in oak toxicity in cattle often include anorexia and constipation or hemorrhagic diarrhea (1,3). Laboratory data in both llamas demonstrated severe azotemia, isosthenuria, metabolic acidosis, increased liver enzymes, and evidence of inflammation, which are abnormalities commonly observed in cattle with oak toxicity (1–3). Oak toxicity in cattle is associated with the high concentrations of tannins of oak, which are hydrolyzed to gallic acid and pyrogallol in the rumen and are responsible for cellular damage (1–3). Tannins cause direct damage to epithelial cells in the gastrointestinal tract inducing irritation and ulceration (2,4). Pyrogallol and other gallic acid metabolites cause acute renal tubular necrosis that results in acute renal failure and uremia, which further irritates the gastrointestinal mucosa and contributes to gastrointestinal tract inflammation (Plasmalyte; Abbot Laboratories) at 75 mL/kg BW per day.

Inflammation of the gastrointestinal mucosa and vacuolar degeneration of the liver observed in case #1 have also been reported in cattle with oak toxicity (2,3). Additionally, gross pathology on case #1 confirmed the presence of oak leaves in the 3 gastric compartments. The severity of renal damage and electrolyte and acid base abnormalities in cattle with oak toxicity depends on the duration of exposure to oaks and the amount ingested (2,3). Initially, affected animals are presented with hyponatremia, hyperkalemia, hypochloremia, hyperphosphatemia, hypocalcemia, metabolic acidosis, and increased anion gap (1,4). Both llamas had severe azotemia and anion gap metabolic acidosis. Llama #1 was hyperkalemic and hypermagnesemic while llama #2 was hyponatremic, hypokalemic, hypochloremic, hypocalcemic, and hyperglycemic. The differences between the 2 animals may be explained by differences in duration of exposure to oak trees, amount of dehydration, and duration of the anorexia. Urine abnormalities observed in cattle after renal tubular necrosis due to oak toxicity include low specific gravity, proteinuria, glucosuria, and hematuria, which were consistent with changes observed in urinalysis in case #2. Intensive fluid therapy, furosemide, and antibiotics were administered to promote diuresis, correct electrolyte and acid base abnormalities, and prevent secondary bacterial infections, respectively. Llama #2 responded favorably to treatment, and the differences in treatment response may have been related to duration of renal failure and degree of systemic compromise.

Other causes of renal tubular necrosis in ruminants include ingestion of heavy metals, antibiotic therapy, non-steroidal anti-inflammatory drugs (NSAIDs), vitamins, and toxic plants (4,5). Reports of acute renal failure in South American camelids are scarce; however, treatment with gentamicin, urinary tract congenital abnormalities (renal agenesis and ureter duplication), hydronephrosis, Eimeria macusaniensis infection, oleander toxicity, and hypervitaminosis D are described as potential causes (6–11). In this report, there was no history of exposure to heavy metals as cause of renal failure.
metal or other toxic plants, nor was there a history of prolonged treatment with antibiotics, NSAIDs, or vitamin D, so causality wasn’t attributed to these nephrotoxic agents. Congenital abnormalities and hydronephrosis were unlikely due to the age of the llamas and necropsy results in case #1. *Eimeria macusaniensis* infection usually presents as a chronic condition with progressive weight loss and hypoproteinemia (6). The clinical diagnosis of oak toxicosis in this report was supported by history of exposure to oak trees, clinical signs, and histopathology. Serum and urine samples were evaluated for the presence of pyrogallol in both cases; however, concentrations were below the detection threshold. Studies in experimental induction of oak toxicosis in cattle demonstrate that after ingestion of oak leaves, calves have detectable levels of pyrogallol in serum and urine only until 6 and 60 h, respectively, suggesting that pyrogallol disappears from serum or urine before clinical signs of renal failure occur, thus preventing definitive diagnosis (2). Differences in the amount and duration of oak ingestion by individual animals and ability of goats to resist oak toxicity may explain the absence of clinical signs in the pasture mates of these llamas (4). Stressful conditions can contribute to susceptibility and clinical signs of oak toxicosis (3), and in these cases, transport and forage scarcity could have played a role in individual susceptibility of the llamas to oaks.

Acute renal failure due to oak toxicosis should be suspected in adult llamas with a history of exposure to oak trees that are presented with depression, anorexia, diarrhea, severe azotemia, and isothenuria. The presence of severe dehydration, marked inflammatory changes in the CBC, hyperkalemia, and hypermagnesemia may be associated with poor prognosis. Initial therapy should focus on rehydration, promotion of diuresis, correction of electrolyte and acid base abnormalities, and prevention of secondary bacterial infections. Long-term intravenous fluid therapy was associated with recovery in 1 case and could be attempted in cases of severe acute renal failure in camels. (cv)

**References**

Jugular thrombophlebitis in horses: A review of fibrinolysis, thrombus formation, and clinical management

Deborah Penteado Martins Dias, José Corrêa de Lacerda Neto

Abstract — Thrombophlebitis of the jugular vein is commonly observed in horses, particularly during intensive care, and leads to local and systemic inflammatory responses as well as head and neck circulatory impairment. Thrombolytic therapy is widely used in human practice with the aim of thrombus dissolution and recanalization of the injured vessels. There are similarities between human and horse coagulation and fibrinolytic processes. This review examines the fibrinolytic system, thrombus formation, and the clinical management of jugular thrombophlebitis, including thrombolytic therapy. There is evidence that early regional thrombolytic therapy for jugular thrombophlebitis in horses may be effective to achieve sustained recanalization.

Résumé — Thrombophlébite jugulaire chez les chevaux : revue de la fibrinolyse, de la formation de thrombus et de la gestion clinique. La thrombophlébite de la veine jugulaire est communément observée chez les chevaux, particulièrement durant les soins intensifs, et cause des réactions inflammatoires locales et systémiques ainsi que des altérations de la circulation dans la tête et le cou. La thérapie thrombolytique est couramment utilisée en pratique humaine dans le but de dissoudre les thrombus et de recanaliser les vaisseaux blessés. Il y a similitudes entre les processus coagulant et fibrinolytique des humains et des chevaux. Cette revue examine le système fibrinolytique, la formation de thrombus et la gestion clinique de la thrombophlébite jugulaire, incluant la thérapie thrombolytique. Il y a des preuves que la thérapie thrombolytique régionale précoce pour la thrombophlébite jugulaire chez les chevaux peut être efficace pour la réalisation d’une recanalisation durable.

Introduction

Thrombophlebitis of the jugular vein in horses is a commonly observed, undesirable iatrogenic complication, particularly during intensive care. Several drugs are widely used for acute thrombolytic therapy in human practice but there are few reports on the use of thrombolytic agents to treat thrombosis in horses (1–4). This review examines the fibrinolytic system, thrombus formation, and the clinical management of jugular thrombophlebitis, including thrombolytic therapy in horses. The review also highlights the evidence supporting the use of streptokinase (SK) as a regional treatment for clinical thrombosis in horses.

The fibrinolytic system

In 1958, Astrup (5) proposed the concept of dynamic equilibrium for coagulation and fibrinolytic systems. In this delicate balance, the fibrinolytic process breaks down fibrin which is continuously deposited throughout the cardiovascular system as a result of limited physiological activation of the coagulation. The coagulation and fibrinolytic systems interact through feedback mechanisms that are not fully understood (6). Fibrinolysis is regulated such that unwanted fibrin thrombi are removed from circulation, whereas fibrin in wounds persists to prevent blood loss and maintain hemostasis (7–9). The vascular endothelium, a highly specialized multifunctional organ, is intimately involved with regulation of hemostasis, supporting anticoagulant mechanisms, including fibrinolysis and inhibition of platelets and serine proteases, to maintain blood fluidity (10). The cascade of reactions leading to thrombus dissolution is schematically illustrated in Figure 1.

The key enzyme in the fibrinolytic system is the glycoprotein plasminogen which is produced in the liver (6). The inactive proenzyme plasminogen is converted to the active enzyme plasmin by 2 specific serine proteases: the tissue-type plasminogen activator (tPA), released from endothelial cells in response to stasis or vessel wall injury, and the urokinase type plasminogen activator (uPA), also called urokinase. The tPA-mediated
pathway is primarily involved in fibrin homeostasis, and the uPA-mediated pathway is involved in cell migration and tissue remodeling (11). Activation of plasminogen to plasmin occurs by the cleavage of an arginine-valine bond, which produces changes in conformation, leading to an increased affinity for both degradation substrates and activators (6). Plasmin, a relatively nonspecific protease, has the capacity to hydrolyze fibrin and various plasma proteins, including fibrinogen and coagulation factors (6,7,12). Plasmin also activates matrix metalloproteinases that, in turn, degrade the extracellular matrix (11).

Fibrinolytic activity is modulated by plasminogen activators and inhibitors (8,10,12). The plasminogen activator inhibitor 1 (PAI-1) is a fast-acting inhibitor of tPA and uPA; PAI-2 is secreted in small amounts under normal conditions, but may be released in high concentration from damaged endothelium (10). The most important inhibitors that act at the plasmin level are alpha2-antiplasmin and alpha2-macroglobulin (8,12). Alpha2-antiplasmin, a single-chain glycoprotein protease inhibitor, is the main physiologic inhibitor of plasmin (6). Plasma concentrations of alpha2-antiplasmin are sufficient to inhibit about 50% of potential plasmin (7). The half-life of alpha2-antiplasmin and plasmin complex is approximately 12 h (6). When massive activation of plasminogen occurs, such as during thrombolytic therapy, alpha2-antiplasmin is depleted, and the high free plasmin levels lead to a “systemic lytic state,” increasing the risk of bleeding from wounds (7). The thrombin activatable fibrinolysis inhibitor (TAFI) is a plasma protein that attenuates the conversion of plasminogen to plasmin. During inflammatory processes, the anti-coagulant effects of protein C are impaired and activation of TAFI is retained. Therefore, fibrinolysis is decreased, adding to the prothrombotic coagulopathy associated with sepsis (9).

Tests for the assessment of fibrinolysis in horses include tests for fibrinogen concentration, fibrin degradation products (FDPs), D-dimer (DD) levels, and thromboelastography (TEG). Fibrinogen concentrations may be difficult to interpret in critically ill horses as the levels change with both inflammation and coagulopathies, although low levels may support increased fibrinolysis. Both FDPs and DD result from fibrinolysis, but FDPs result from the degradation of both fibrin and fibrinogen (13), while DDs (formed only by the plasmin digestion of cross-linked fibrin) are considered specific for fibrin (13,14). Fibrin monomers (FM), the initial products of fibrin formation, form high molecular weight complexes with fibrinogen and FDPs and is an accurate indicator of an activated state of coagulation. Fibrin monomers may be deposited locally, in cases of thrombosis, or diffusely, in cases of disseminated intravascular coagulation (DIC) in humans (15,16). In horses, FM also indicates the coagulation state. Clinical studies evaluating horses after colic surgery reported high levels of FM before the occurrence of jugular vein thrombosis (17) and DIC (18). Antithrombin (AT) inactivates thrombin and some coagulation factors, and is considered the main inhibitor of coagulation (19). In horses undergoing colic surgery, reductions in AT corresponded to the severity of intestinal lesions (20). Evaluating coagulation and fibrinolysis indicators, Feige et al (20) showed that activation of coagulation and fibrinolysis increased after the colic surgical procedure, marked by a prolonged activated partial thromboplastin time, and by increased concentrations of DD and FM. The authors also reported that surgical trauma per se did not influence coagulation, and changes were due to the primary disease. The study concluded that high FM and DD concentrations represent an increased risk for the development of a coagulopathy after colic surgery.

Figure 1. Schematic representation of fibrinolysis showing tissue plasminogen activator (tPA) pathway. Tags: plasminogen (Pmg); plasminogen activator inhibitor-1 (PAI-1); alpha2-antiplasmin (α2-AP); activation (1); inhibition (2).
Thromboelastography measures global hemostatic function of whole blood in vitro, documenting the interaction between platelets and coagulation cascade proteins (21) and provides information on clot kinetics and mechanical properties from formation through maturation and fibrinolysis. The use of whole blood allows the analysis of cellular and plasma components, providing a global assessment of hemostatic potential (22,23). Validation of TEG in horses and establishment of the first reference values were performed by Paltrinieri et al (24). Thromboelastography may be a clinically useful tool in horses. For example, in horses presenting with gastrointestinal diseases, TEG was an effective method to determine coagulation and fibrinolysis changes, as well as to distinguish hypocoagulation and hypercoagulation states (22,25).

**Thrombus formation**

The equilibrium proposed by Astrup (5) is easily overwhelmed during pathologic coagulation states. In such states, the fibrinolytic system fails to maintain fluidity of the blood in the affected vessels, resulting in thrombosis (6). Equine diseases commonly associated with coagulation abnormalities include gastrointestinal diseases and sepsis, often associated with endotoxia or the systemic inflammatory response syndrome (SIRS) (13,26). Other conditions in horses associated with coagulopathies include genetic coagulation defects, neoplasia, protein-losing enteropathy, and protein-losing nephropathy (26).

Horses with gastrointestinal disorders and sepsis may develop coagulopathies characterized by excessive activation of coagulation, and impairment of the fibrinolysis and anti-coagulant pathways (9,13,27,28). The degree of abnormal coagulation with gastrointestinal diseases may be mild to marked, depending upon the severity of the disorder. Simple obstructions and displacements usually produce a mild to moderate activation of the coagulation system, usually compensated by the fibrinolytic system. More severe problems such as intestinal strangulation or enteritis may produce a marked prothrombotic state, which can lead to disseminated intravascular coagulation (9,28). Medical treatment of acute abdomen, or postoperative care of horses undergoing surgery for gastrointestinal lesions is often intensive and frequently necessitates long-term maintenance of a jugular catheter for administration of intravenous fluids and medications. If these horses have concurrent coagulopathies, in association with jugular vein trauma and inflammation occurring with catheterization, they are at increased risk for the development of thrombophlebitis of the jugular vein (13,28). Mair and Smith (29) reported that 8.3% of 252 horses that underwent surgical treatment of colic developed jugular vein thrombophlebitis.

The imbalance leading to thrombus formation may be a result of multiple factors, including vessel injury or other intrinsic vessel wall lesion, a low-flow state or venous stasis, and blood hypercoagulability (6,30). This classic triad, describing the pathogenesis of thrombosis, was first outlined by Virchow in 1856 (cited in reference 30). Experimentally and clinically, it is now recognized that at least 2 of these 3 postulated factors in combination are essential in the progress of venous thrombosis. In humans, decreased blood flow or stasis seems to be the dominant component (31). However in horses, local trauma is the most important factor of this triad in the development of jugular vein thrombosis (32).

Thrombosis begins with platelets adhering to macromolecules in the subendothelial regions of the injured blood vessel to form the primary hemostatic plug. The platelets then stimulate local activation of plasma coagulation factors, leading to the generation of a fibrin clot that reinforces the platelet aggregate. Within an intact blood vessel, thrombosis is prevented by the body’s anticoagulant mechanisms. Prostacyclin (PGI2), antithrombin, heparan sulfate proteoglycans, protein C, protein S, ADPase, and TF pathway inhibitor (TFPI) are examples of natural thrombosis inhibitors (7,9,33,34). Activated protein C and protein S, in the circulation or on the endothelium surface, block the inhibitory effect of PAI-1. Therefore, plasminogen may exert its function leading to fibrinolysis, thereby preventing thrombotic processes (10).

**Jugular thrombophlebitis in horses**

Thrombophlebitis is defined as venous thrombosis secondary to inflammation of the vessel wall (35–37). Infection can complicate and enhance this venous disorder. In septic thrombophlebitis, there is bacterial or, rarely, fungal colonization of the vessel wall, thrombus, and, occasionally, of the surrounding perivascular tissues (38). Blood flow is impaired due to reduced vascular lumen by partial or complete occlusion (38,39). Thrombophlebitis most commonly affects the jugular veins in horses because they are the most commonly used site to access venous circulation. The disease is associated with poor venipuncture technique, prolonged or improper placement of indwelling catheters, and infections of irritating drugs that lead to mechanical or chemical injury of the vessel wall (30,36,40–44). An atypical etiology of jugular thrombophlebitis, extending directly from a penetrating buccal ulcer in a horse, was described by Matsuda et al (45).

The development of thrombophlebitis following catheterization is dependent on catheter composition, venipuncture technique, cannula size, catheter maintenance, pH of the infusate solution, duration of infusion, and presence of bacteria (46). All of these factors underscore the importance of using aseptic techniques to implant and maintain venous catheters.

A bacteriological study assessing techniques for disinfecting sites prior to the insertion of jugular intravenous catheters in horses reported that chlorhexidine and povidone-iodine were equally effective when used on skin after the hair had been clipped (47). The authors concluded that clipping or shaving the hair over the veins prior to disinfection is recommended, but there were no differences when the hair was left long, clipped, or shaved. Therefore, the skin can be disinfected effectively with either agent without clipping or shaving the hair when rapid intravenous catheterization is a clinical priority.

The pharmaceuticals most frequently associated with the development of thrombophlebitis include glycerol guaiacolate, thiopental, calcium gluconate, phenylbutazone, and oxytetracycline (38,39). Phenylbutazone, widely used for anti-inflammatory therapy of musculoskeletal system injuries of athletic horses, is commonly associated with thrombophlebitis when it is accidently infused in the perivascular region (39,48).
Clinical signs associated with aseptic jugular vein thrombosis are generally limited to localized firmness and a cord-like jugular vein. Venous distention proximal to the thrombus site is observed when there is complete occlusion. When bacteria are seeded in thrombi resulting in septic thrombophlebitis, horses have intermittent fever, depression, and neck stiffness. Palpation elicits local swelling, heat, pain, and a cord-like jugular vein. Generally, leukocytosis, neutrophilia, and hyperfibrinogenemia are present (49,50). As reported by Ryu et al (51), septic thrombi in the jugular vein may also lead to pleuropneumonia via the pulmonary circulation.

The diagnosis of septic or nonseptic thrombophlebitis is primarily based on history and physical signs (38,39,49). The disease is evaluated with hematology tests, ultrasonography, contrast angiograms, and bacteriologic confirmation (35,49,50,52,53). Ultrasonography of the vein and surrounding tissue can be used to specifically characterize the thrombus and monitor the extent and progress of the lesion (37,54). The jugular vein and its valves can be readily identified (35). In cases of thrombophlebitis, ultrasonography allows an evaluation of vessel walls, blood flow compromise, and presence, extension and shape of the thrombus, as well as compensatory vascularization and recanalization characteristics (55). The sonographic appearance of the normal jugular vein is that of an anechoic circular or tubular structure, with identification of a more hyperechoic vessel wall (38). Inflamed jugular veins often appear thick-walled, and the thrombus is imaged as a partially or totally occlusive hyperechoic structure adhering to the vessel wall. In cases of partial obstruction, the blood flow appears as an anechoic area between the thrombus and opposite vessel wall where the thrombus is connected (38,56,57). If only partial obstruction to blood flow is present, distension of the vein by distal digital distension and recanalization characteristics (55). A septic thrombus appears as a hyperechoic heterogeneous cavitating mass in which the anechoic areas represent fluid accumulation secondary to infection and necrosis (38,50,54). Anaerobic bacterial infections often show numerous hyperechoic areas creating an acoustic shadow due to gas production (38). Blood flow across the affected vessel may be evaluated by venography, or with pulsed-wave or color-coded Doppler (50).

If a catheter is still in place when a thrombosis is discovered, the catheter should be carefully withdrawn and the tip cultured (26,35). Identification of the infectious agent and its drug susceptibility is important for treatment (35). While the catheter remains in situ, the thrombus will not dissolve, and it may grow (58). Furthermore, the injured vessel should be preserved, and venipuncture should be avoided. The opposite jugular vein should also be preserved to avoid the risk of bilateral thrombophlebitis. Lateral thoracic, cephalic, and saphenous veins are other options for drug administration and venous blood collection (59). In a retrospective study, Dolente et al (26) reported severe intestinal disease, hypoproteinemia, salmone-losis, and endotoxemia as potential risk factors for development of catheter-associated jugular thrombophlebitis in horses.

Both medical (35,43,60,61) and surgical (40,42,62–66) treatments for thrombophlebitis are reported. Local treatment consists of hot packs and hydrotherapy applied over the swollen vein 3 or 4 times daily and the application of dimethyl sulfoxide (DMSO) solution on the affected area. Non-steroidal anti-inflammatory drugs may be useful in reducing pain and inflammation. Systemic antibiotics are indicated for sepsis (35,43,50,61). Bonagura et al (50) suggested metronidazole at 15 mg/kg body weight (BW), PO, q6h, or at 25 mg/kg BW, PO, q12h in cases of anaerobic infection. If the thrombotic lesion is associated with a generalized coagulopathy, heparin therapy [unfractionated, 40 to 100 IU/kg BW, IV or SQ, q6h; low molecular weight (Dalteparin), 50 to 100 IU/kg BW, SQ, q24h] may be beneficial (67). Efficacy and side effects of low molecular weight heparin (LMWH) compared to unfractionated heparin (UH) have been evaluated in horses with gastrointestinal diseases. As a dose of 50 IU/kg BW, q24h, LMWH decreases the incidence of jugular thrombosis compared to treatment with UH in horses having colic surgery (68). Aspirin at a dose of 20 mL/kg BW every other day is also recommended for the treatment of thrombophlebitis to inhibit platelet activation and aggregation (30). Scott et al (60) reported 2 cases of jugular vein thrombophlebitis successfully treated by warfarin anticoagulation. However, the authors recommend this therapy only in situations in which the coagulation status can be monitored by daily laboratory determinations of prothrombin time.

When jugular vein thrombophlebitis is refractive to medical treatment, surgical techniques including phlebotomy, thrombectomy with Fogarty's catheter, or venous grafts may be performed to restore blood flow (40,42,62–66). Dias et al (57) performed an ultrasonographic evaluation during the acute phase of experimental jugular vein thrombophlebitis in horses and demonstrated that the major thrombus development occurs in the early stages of injury. These findings suggest that the first 24 h may represent the most effective intervention period. In horses, the complications associated with jugular vein thrombophlebitis include pleuropneumonia, bacterial endocarditis, pulmonary thromboembolism, septicemia, and other conditions associated with metastasis of septic thrombi (44).

The long-term outcome for a thrombus is variable. Recanalization of the vein may take place. The thrombus may undergo fibrous organization without recanalization or collateral circulation may develop (44). Hussni et al (69) observed via angiography that collateral vascularization develops within 1 y in horses submitted to a unilateral jugular vein resection that restores the venous drainage of the head and neck. If the jugular venous obstruction persists and collateral vascularization does not occur, especially when both jugular veins are involved, dysphagia and dyspnea due to impaired venous return from the head is likely to limit athletic performance (38,42,50). Moreau and Lavoie (44) suggested that thrombophlebitis did not affect the athletic performance of horses used for pleasure riding and other nonracing activities, even when the horses suffered bilateral occlusion. However, thrombophlebitis in racing Standardbreds was associated with a decreased chance of return to racing.

Thrombolytic therapy and streptokinase
The medical treatments for equine jugular vein thrombophlebitis are often ineffective, and restoration of blood flow
is typically only achieved with complex and expensive surgical procedures. In human medicine, thrombolytic therapy involving fibrinolytic agents has revolutionized the treatment of diverse circulatory disorders, such as pulmonary embolism, deep-vein thrombosis, and myocardial infarction (12). It has been possible to treat intravascular thrombosis and achieve complete dissolution by using drugs capable of stimulating the fibrinolytic system (6). Thrombolytic therapy consists of the pharmacological dissolution of the blood clot by intravenous infusion of plasminogen activators that activate the intrinsic fibrinolytic system components (11,12). Thrombolytic drugs dissolve both pathologic thrombi and fibrin deposits at sites of vascular injury, with the risk of hemorrhage as the major side effect (7). Streptokinase (SK) is a nonenzymatic protein produced by strains of β-hemolytic streptococci (6,11,12). The capacity of SK to promote the lysis of blood clots was first described by Tillett in 1933 (cited in reference 70); the effect is thought to be mediated by enzymatic action on fibrin (70). Streptokinase combines with plasminogen to form a stable activator complex that has enzymatic activity (71). This SK-activator complex then activates the fibrinolytic mechanism by converting uncomplexed plasminogen to plasmin. The SK-plasminogen complex is slowly converted to a SK-plasmin form, which can also activate and convert plasminogen. The initial activity is mediated by the SK-plasminogen complex, whereas the later activity is mediated by the SK-plasmin form (6). Streptokinase is a foreign protein, and its introduction into the circulatory system can elicit an anaphylactic response (8). Plasma antibodies against SK are normally present as a result of prior streptococcal infections. Therefore, systemic lytic therapy only becomes effective when enough of the drug has been administered to overcome these antibodies (7). Lytic agents can be administered systemically or regionally (6).

In the attempt to avoid the hemorrhagic consequences of thrombolytic therapy, Dotter et al (72) proposed a low dose, local infusion of SK for the treatment of arterial occlusive disorders. Due to the smaller total dose of SK in local application, there were fewer complications than with systemic therapy. Regional thrombolytic therapy was further developed, and local targeted instillation through a catheter implanted into thrombotic material was proposed (6,73). The technique makes local fibrinolysis possible, and, importantly, this process is partially protected from circulating inhibitors. Regional thrombolytic therapy with SK has been used successfully in human practice for venous thrombotic disorders of superficial veins, such as the axillosubclavian vein (6). The use of SK may be successful for jugular vein thrombophlebitis in horses, given the similarity between horse and human thrombosis development processes (74), and the superficial localization and easy access to the jugular vein in horses. Nevertheless, there are few investigations analyzing SK fibrinolytic activity in horses. The use of SK in horses was first reported in 1966 and 1968 to treat aortic and left iliac thrombosis, respectively. Streptokinase was administrated in association with streptodornase, plasminogen, and sodium gluconate. Unfortunately, the authors could not specify which fibrinolytic agent led to case resolution (1,2). Lions et al (3) described the administration of SK to treat jugular thrombophlebitis in horses, showing evidence of SK fibrinolytic activity; however, their methods are not fully established. According to Dias et al (4), regional thrombolytic therapy using a bolus administration of 100 mL of SK solution (7500 IU of SK per mL of 0.9% sodium chloride solution) may be effective for resolving induced jugular vein thrombosis in horses, and providing transitory recanalization.

Other applications for fibrinolytic therapy have been reported besides jugular thrombophlebitis in horses. Clark-Price et al (75) utilized recombinant tPA in the anterior chamber of each eye of a foal with fibrin accumulation associated with endotoxemia and septicemia, providing fibrin clot clearance and restoring normal vision. Hilton and Pusterla (76) also used fibrinolytic therapy in the management of septic pleuropneumonia in a horse.

Early regional thrombolytic therapy for jugular thrombophlebitis in horses may be effective to achieve sustained recanalization. A thorough understanding of the fibrinolytic system and the potential complications associated with its modification is an essential foundation for advances in thrombolytic therapy. Additional research is needed to expand our knowledge of the fibrinolytic system, and to develop new clinical applications to address coagulation problems in horses. The authors hope to stimulate new investigations analyzing drugs capable of activating the fibrinolytic system in horses, and to promote future development of novel treatments for jugular thrombophlebitis and other diseases associated with fibrin accumulation in horses.

Acknowledgments

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References


Johanzen J, Lønning V, Nøkkel H, et al. Comparison of unfractioned and low molecular weight heparin for prophylaxis of coagulopathies in

**Answers to Quiz Corner**

**Les réponses du test éclair**

1. **e)** Conception can occur from a mating more than 7 days before ovulation to 5 days after ovulation.
   **e)** La conception peut se produire à partir du premier accouplement plus de 7 jours avant jusqu'à 5 jours après l'ovulation.

2. **b)** Fractures on one side of the bone, with bending of the opposite side, are called greenstick fractures. They occur primarily in young growing dogs.
   **b)** Les fractures sur le côté d'un os avec courbure du côté opposé sont nommées fractures en bois vert. Elles se produisent principalement chez les jeunes chiens en croissance.

3. **b)** Hemimandibulectomy is most likely to prevent recurrence.
   **b)** L’hémimandibulectomie est la plus susceptible de prévenir une récidive.

4. **e)** Unlike dogs, cats do not develop diabetic cataracts because of a difference in their lens metabolic pathway.
   **e)** Contrairement aux chiens, les chats ne développent pas de cataractes diabétiques à cause d’une différence dans leur voie métabolique du cristallin.

5. **a)** These signs describe guttural pouch tympany.
   **a)** Ces signes décritvent du tympanisme de la poche gutturale.

6. **e)** This foal had unilateral disease, so fenestration of the median septum would allow trapped air to exit through the normal right guttural pouch.
   **e)** Cette poulie souffre d’une affection unilatérale, de sorte que la fenestration du septum médian permettra à l’air de s’échapper par la poche gutturale droite qui n’est pas atteinte.

7. **c)** Calves can become infected with *Cryptosporidium* as early as 3 days of age.
   **c)** *Cryptosporidium* peut infecter les veaux qui sont âgés de moins de 3 jours.

8. **e)** Though a good indicator of hepatocellular damage in some species, serum alanine aminotransferase activity is not helpful in the diagnosis of liver disease in cattle.
   **e)** Bien qu’un bon indicateur du dommage hépatocellulaire chez certaines espèces, l’activité de l’alanine aminotransférase sérique n’est pas utile pour le diagnostic des maladies hépatiques chez les ruminants.

9. **c)** Hypotension can be observed following the administration of propofol in healthy patients. The effect is exacerbated by dehydration. Propofol does not directly affect heart rate or myocardial contractility.
   **c)** On peut observer de l’hypotension à la suite de l’administration de propofol chez les patients en santé. Les effets sont exacerbés par la déshydratation. Le propofol n’affecte pas directement la fréquence cardiaque ou la contractilité du myocarde.

10. **d)** Eosinophilia occurs commonly in response to antigen-antibody reactions, as well as with inflammation of certain organs, such as the lungs, which tend to be allergy targets.
    **d)** L’éosinophilie se produit communément en réponse aux réactions antigène-anticorps ainsi qu’en présence d’une inflammation de certains organes comme les poumons, qui sont des cibles pour les allergies.
Case Report  Rapport de cas

Cholesterol granuloma associated with otitis media and leptomeningitis in a cat due to a *Streptococcus canis* infection

Sara Van der Heyden, Patrick Butaye, Stefan Roels

Abstract — Cholesterol granuloma in the middle ear is a pathological condition often associated with otitis media in humans. Cholesterol granulomas in cats are rarely described. To our knowledge, this is the first report of middle ear cholesterol granuloma in a cat, associated with otitis media and leptomeningitis due to a *Streptococcus canis* septicemia.

Résumé — Granulome à cholestérol associé à une otite moyenne et à une leptoméningite chez un chat causé par une infection par *Streptococcus canis*. Un granulome à cholestérol dans l’oreille moyenne est une affection pathologique souvent associée à l’otite moyenne chez les humains. Les granulomes à cholestérol chez les chats sont rarement décrits. À notre connaissance, il s’agit du premier rapport d’un granulome à cholestérol de l’oreille moyenne chez un chat, associé à l’otite moyenne et à la leptoméningite, causé par une septicémie à *Streptococcus canis*.

(Traduit par Isabelle Vallières)

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Cholesterol granulomas are non-neoplastic lesions with characteristics of a granuloma, containing cholesterol crystals (1). Factors necessary for the development of cholesterol granuloma are hemorrhage, interference with clearance or drainage, and obstruction of air exchange or ventilation (1). Middle ear cholesterol granuloma is a pathological condition often associated with otitis media in humans (1). In veterinary medicine, cholesterol granulomas are seen in the choroid plexus (plexus cholesteatoma) of the ventricles in 20% of older horses as an asymptomatic aging change and incidental finding on necropsy (2). In dogs, cholesterol granulomas are only rarely found in the middle ear, the maxilla, and the brain (3–5) and have recently been associated with otitis media (6). Cholesterol granulomas in cats are rarely described in the uterus (7) and brain (8,9).

To our knowledge, this is the first report of a case of middle ear cholesterol granuloma in a cat, which was associated with a *Streptococcus canis* septicemia, leptomeningitis, and otitis media.

Case description

A stray, adult, black female domestic long-haired cat was found with signs of cachexia, moaning when manipulated, apathy, depression and weakness, circling and ataxia. Due to poor health status the cat was euthanized.

On postmortem examination, the animal was cachectic and dehydrated with an unhealthy coat. Both external ears were dirty with thick brown granular material in the ears and the right bulla tympanic wall was wet, with thickening and white foci. The gross appearance of the brain, meninges, and left tympanic bulla was normal. Samples of the right bulla tympanic wall, the cerebrum, cerebellum and brainstem, liver, and spleen were collected for bacteriological and histopathological examination.

Samples for histopathology were fixed in neutral-buffered formalin, embedded in paraffin wax, sectioned (5 μm) and stained with hematoxylin and eosin (H&E). Histological examination of the right bulla wall demonstrated predominantly fibrovascular tissue with some areas of ossification. Multiple acicular empty clefts typical for cholesterol crystals were present, surrounded by aggregates of foamy macrophages. Lymphocytes, plasma cells, and some neutrophils were also present. The granulation tissue was partially covered by flattened, simple squamous epithelium. The leptomeninges of the cerebrum showed some infiltrating mononuclear inflammatory cells, while there was no meningitis at the level of the brain stem and cerebellum. Histopathological
lesions were absent in the brain parenchyma. Bacteriological examination revealed the presence of β-haemolytic colonies on blood agar plates (BioMérieux, Brussels, Belgium) and selective Gram-positive plates (colistin aztreonam plates, CAP, Oxoid, Erembodegem — Aalst, Belgium) in all tissue samples. The bacterium was identified as *Streptococcus canis* by tDNA-polymerase chain reaction (PCR) (10).

**Discussion**

*Streptococcus canis* can belong to the normal flora of the perianal region, oral cavity, and upper respiratory tract and has been associated with pyogenic infections of the respiratory tract, skin, genitourinary system, eyes, bones, and cardiovascular system of dogs and cats (11–13). Outbreaks with fatal infections have been reported in intensively housed shelter cats (14) and breeding colonies (15).

Otitis media, inflammation of the middle ear structures, can be initiated via rupture of the tympanic membrane (most common), through the auditory tube or rarely by hematogenous spread (16). Cats may develop otitis media, similar to piglets (17), through the auditory tube secondary to upper respiratory disease (18). Spread of infection from the middle and inner ear to the brain may occur by erosion through the medial aspect of the petrous temporal bone, by migration of bacteria along existing vascular or neuronal pathways, or via hematogenous spread, and can result in meningitis, encephalitis, or abscess formation (19). Although considered uncommon, central nervous system invasion as a complication of otitis media has been demonstrated in animals (19,20).

It is generally agreed that most cases of otitis in veterinary patients are caused by bacteria, of which *Staphylococcus* and *Streptococcus* spp. are among the most commonly isolated (16,21). All organ samples showed presence of *S. canis* and hematogenous spread is assumed. To the authors’ knowledge, this is the first report of middle ear cholesterol granuloma in a cat, associated with otitis media and leptomeningitis due to a *S. canis* septicemia.

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**References**


Case Report  Rapport de cas

Infiltrative lipoma compressing the spinal cord in 2 large-breed dogs

Marc K. Hobert, Christina Brauer, Peter Dziallas, Ingo Gerhauser, Dorothee Algermissen, Andrea Tipold, Veronika M. Stein

Abstract — Two cases of infiltrative lipomas compressing the spinal cord and causing nonambulatory paraparesis in 2 large-breed dogs are reported. Magnetic resonance imaging (MRI) revealed severe extradural spinal cord compression by inhomogenous masses that infiltrated the adjacent tissues and the muscles of the spine in both dogs. The presumptive clinical diagnoses were infiltrative lipomas, which were confirmed by histopathology. In rare cases infiltrative lipomas are able to compress the spinal cord by the aggressive growth of invasive adipocytes causing neurological deficits.

Résumé — Lipome infiltrant comprimant la colonne vertébrale chez 2 chiens de grande race. Deux cas de lipomes infiltrants comprimant la colonne vertébrale et causant une paraparésie non ambulatoire chez 2 chiens de grande race sont signalés. L’imagerie par résonance magnétique (IRM) a révélé une compression extradurale grave de la colonne vertébrale par des masses inhomogènes qui infiltraient les tissus adjacents et les muscles de la colonne vertébrale des 2 chiens. Les diagnostics cliniques présumés étaient des lipomes infiltrants, ce qui a été confirmé par histopathologie. Une croissance agressive des cellules adipeuses a causé les déficits neurologiques.

S ubcutaneous tissue adipocytes are considered to be the cells of origin of infiltrative lipomas and of well-demarcated lipomas. Both tumor types, therefore, have similar histological appearance (1). Typically, lipomas are benign neoplasms that have no tendency to metastasize. Nevertheless, they are able to invade adjacent tissue such as muscles and connective tissue, bones, and in rare cases peripheral nerves and the spinal cord (2,3). In general, lipomas are poorly defined and grow slowly but they can also exhibit periods of rapid growth (4). The definitive diagnosis of infiltrative lipoma can only be made by histological evaluation (5). It is not known why some lipomas develop a locally invasive behavior and form the infiltrative lipomas (2). The recurrence rate, even after aggressive surgical resection ranges from 36% to 50% in contrast to simple lipomas in which the local recurrence rate is < 2% (2,3,6). Therefore, adjuvant therapy such as radiation or chemotherapy is recommended (7,8).

This case report describes the neurological signs, magnetic resonance imaging (MRI), and histopathological findings in 2 large-breed dogs suffering from infiltrative lipomas compressing the spinal cord.

Case descriptions

Case 1
A 5-year-old, female, intact Bernese mountain dog was presented to the Department of Small Animal Medicine and Surgery of the University of Veterinary Medicine Hannover, Germany, with a history of falling from a first floor balcony missing a balustrade the night before. Since this accident the dog was unable to walk. The referring veterinarian treated the dog with glucocorticosteroids. In addition to the acute trauma, the dog had a history of progressive weakness of the hind limbs for the past 4 to 5 wk.

The physical examination was normal with the exception of an elevated body temperature (39.9°C). The neurological examination revealed a nonambulatory spastic paraparesis with accentuation to the left side and with severe deficits in the postural reactions of the hind limbs. The patellar reflex was decreased in both hind limbs. The postural reactions in the front limbs were unremarkable. The dog was not in pain when the spine was palpated. The cranial nerves were unremarkable. The neuroanatomical localization was L3–L4 because of the reduced patellar reflex and T3–L3 because of the spastic paraparesis. A chronic progressive disease such as neoplasia, degenerative myelopathy, or disc disease was suspected with a superimposed spinal cord trauma. The dog had a mild to moderate leukocytosis [20.8 × 10^9/L, reference interval (RI): 6.0 to 17.0 × 10^9/L] with neutrophilia 18.0 × 10^9/L (RI for segmented neutrophils: 3.0 to 11.5 × 10^9/L), a mild lymphopenia (0.97 × 10^9/L, RI: 1.0 to 4.8 × 10^9/L) and a monocytosis (1.7 × 10^9/L, RI: 0.18...
The electrolyte profile showed a mild decrease in ionized calcium concentration (1.22 mmol/L, RI: 1.25 to 1.47 mmol/L). Total protein was mildly increased to 71.3 g/L (RI: 60 to 70 g/L). The base excess (BE) of the venous blood gas was −6.2 (RI: −4.0 to 4.0). The partial thromboplastin time (PTT) was 12.4 s (RI: 14.5 to 19.0 s).

Thoracic radiographs showed a mild radiolucency of the spinous process of Th9. A MR scan (Philips Achieva 3.0 T; Philips Healthcare, PC Best, The Netherlands) revealed an inhomogeneous hyperintense area in T1- and T2-weighted sequences at the level of the 9th thoracic vertebra (Th9) extending from the right Musculus longissimus and M. multifidus to the spinal cord. The hyperintense area reached extradurally into the vertebral canal to the right side of the spinal cord and displaced the spinal cord to the left side. The adjacent muscles in the right paravertebral region, the M. longissimus thoracis, M. multifidus lumborum, M. spinalis et semispinalis thoracis et cervicis, and the M. intercostalis internus and externus showed hyperintense

to 1.35 × 10⁹/L). The electrolyte profile showed a mild decrease in ionized calcium concentration (1.22 mmol/L, RI: 1.25 to 1.47 mmol/L). Total protein was mildly increased to 71.3 g/L (RI: 60 to 70 g/L). The base excess (BE) of the venous blood gas was −6.2 (RI: −4.0 to 4.0). The partial thromboplastin time (PTT) was 12.4 s (RI: 14.5 to 19.0 s).

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Figure 1a. T2-weighted sagittal magnetic resonance image of the thoracic portion of the vertebral column of the dog in case 1. A hyperintense mass is visible in the dorsal paraspinal region extending from Th8 to Th9 with consecutive compression of the spinal cord in this region. The spinal cord and the adjacent muscles are hyperintense compared to surrounding musculature (arrowhead) and spinal cord (star), respectively. The vertebral body of Th9 is characterized by a central hyperintense area (arrow).

Figure 1b. T2-weighted transverse image of the mass in the region of Th9 of case 1. The hyperintense mass is compressing the spinal cord from the right to the left side (arrowhead). The adjacent tissue is also hyperintense (stars).

Figure 2. T2-weighted transverse image with fat saturation (Spectral Adiabatic Inversion Recovery, SPAIR) of the mass in the region of Th9 of case 1. The mass (arrowhead) compressing the spinal cord (arrow) from the right side exhibits signal characteristics comparable to that of subcutaneous fat tissue (star). This finding suggests that the mass has a fatty origin.
areas in T2- and T1-weighted sequences. The extent of the whole hyperintense lesion was 2.6 × 3.4 cm (length × width) with a height of 4.0 cm. The vertebral body of Th9 exhibited a central inhomogenous hyperintense area (Figures 1a, 1b). In a T2-weighted Spectral Adiabatic Inversion Recovery (SPAIR) sequence, which is a fat saturation sequence, all alterations appeared hypointense compared to the spinal cord and isointense compared to the subcutaneous fat tissue (Figure 2). After intravenous administration of contrast medium (Gadolinium 64Gd, “Dotarem®;” Guerbet, Roissy, France) the mass lesion showed a mild contrast enhancement. With these MR findings the infiltrating tissue was identified as fatty tissue and a tentative diagnosis of infiltrative lipoma was made.

Due to the guarded prognosis the owners elected euthanasia and an infiltrative lipoma was diagnosed at necropsy. In the region of Th9 to Th10 a focal, whitish-yellowish, soft tissue mass with dimensions of 4.0 × 1.0 × 0.4 cm (length × width × height) was detected that reached and broke into the vertebral canal and also infiltrated the neighboring muscles. The compression of the spinal cord resulted in degeneration in the region of Th9 to Th10. Histological examination of this region verified the macroscopic findings. The paravertebrally located lipoma focally infiltrated into the vertebral canal (Figure 3). Furthermore, acute hemorrhages were detected in the right axillary lymph node, the pancreas, and the lung in the macroscopic pathological examination. In the histological examination the right axillary lymph node and the lung showed mild, acute, multifocal hemorrhages. The pancreas had mild, acute, multifocal, interstitial hemorrhages. The hemorrhages were attributed to the acute trauma due to the falling from the balcony.

**Figure 3.** Cross-section of Th10 after paramedian opening of the vertebral canal and removal of the spinal cord. The infiltrative lipoma is visible outside the vertebral canal lateral to the arcus vertebrae (arrowhead) and infiltrates into the vertebral canal (asterisk) through the vertebral arc (arrow). Hematoxylin and eosin (H&E), decalcified, bar 10 000 μm.

**Figure 4.** Transverse T2-weighted SPAIR-sequence in the region of Th10 of case 2. The spinal cord (arrow) is compressed by a hypointense mass to the right side (dotted line). The SPAIR-sequence decreases the signal intensity of the mass (dotted line) as the signal intensity of the subcutaneous fat is decreased (arrowheads). The adjacent musculature (star) is characterized by hyperintense signal intensity (compared with the surrounding musculature) which could be linked to the histopathologic diagnosis of myositis.

**Figure 5.** Transverse T1-weighted magnetic resonance image of the thoracic region of Th10 of case 2 post contrast administration. Both the muscles and the mass show moderate contrast enhancement (arrowhead and star). The moderate compression of the spinal cord is obvious (arrow).

**Case 2**

A 10-year-old, male, entire crossbreed dog was presented to the Department of Small Animal Medicine and Surgery, University of Veterinary Medicine Hannover, Germany with a 10-day history of progressive gait abnormalities in the hind limbs finally leading to a nonambulatory paraparesis. The dog had received glucocorticosteroids 9 d prior to presentation as well as 200 mg carprofen (Rimadyl; Pfizer, Berlin, Germany) once a day for 7 d. Both popliteal lymph nodes were prominent and the urinary bladder...
was filled. The neurological examination revealed a nonambulatory paraparesis with reduced proprioception in both hind limbs. A mild hyperesthesia was noted when the dog was palpated at the thoracolumbar junction of the spine. The cranial nerves and the spinal reflexes were unremarkable. The neuroanatomical localization of the lesion was T3-L3 and a chronic progressive disease such as neoplasia or disc disease was suspected. The complete blood (cell) count (CBC) showed a mild leukopenia (5.3 × 10^9/L). Radiographs of the spinal column showed decreased widths of the intervertebral disc spaces Th10/11, Th11/12, and Th12/13. In T2-weighted MR images a hypointense mass was visible in the vertebral canal at Th10/11 with a length of 2 vertebral bodies, causing severe spinal cord compression. The adjacent muscles (M. spinalis and semispinalis, and M. multifidus) appeared inhomogeneous and hyperintense in the T2-weighted sequence. In the SPAIR sequence the mass itself was hypointense with hyperintense areas of the surrounding muscles and tissue (Figure 4). The compressing mass, the adjacent muscles and tissue showed a mild contrast enhancement (Figure 5).

The owners elected euthanasia due to the guarded prognosis and declined necropsy. However, 3 tru-cut biopsies were permitted and sampled from the mass to confirm the diagnosis. The histopathological examination revealed well-differentiated skeletal muscle fibers as well as adipocytes infiltrating the skeletal muscle fibers, accompanied by focal lymphohistiocytic cell infiltration (Figures 6a, 6b). An infiltrative lipoma causing secondary muscle degeneration and myositis in the surrounding muscles was highly suspected.

**Discussion**

Infiltrative lipomas invading and compressing the spinal cord in dogs are rarely described (9–11). In both dogs described herein, infiltrative masses compressed the spinal cord in the thoracic region causing nonambulatory paraparesis. Both, MR scans and histopathology, identified the masses as infiltrative lipomas. Lipomas are benign neoplasms that consist of localized nodules of fat and originate from adipocytes of the subcutaneous tissue. Infiltrative lipomas are locally invasive and may cause pain and/or clinical signs due to the compression of neighboring tissues (11,12). Unlike lipomas, infiltrative lipomas may cause pain upon palpation (1). In humans, pain occurs when the infiltrative lipoma compresses or involves adjacent neurovascular and/or muscular structures (13). Histologically, infiltrative lipomas and lipomas both consist of well-differentiated adipocytes (14). The dog in Case 2 showed a mild hyperesthesia when palpated at the thoracolumbar junction of the spine. This could have been caused by compression of the adjacent neurovascular structures and secondary inflammation of the muscles in this region. Both
dogs were large-breed dogs, and, although infiltrative lipomas can occur in any breed, there seems to be a higher incidence in Labradors, doberman pinschers, and mixed breed dogs (11,12). Whereas 1 report stated that older female dogs may also be overrepresented (12) another claimed that infiltrative lipomas occur commonly in middle-aged dogs (15). Females are affected 3 times as often as males (12,15). The 2 dogs in this report did not have similar signalments: case 1 involved a middle-aged (5 y) female Bernese mountain dog, whereas case 2 was a relatively old (10 y) large male mixed-breed dog. Both dogs were not overweight, which is consistent with the thesis of Kramek that obesity does not appear to be a prerequisite for the disease (15).

The 2 patients reported here clearly demonstrate the strength of MR imaging as a diagnostic tool for soft tissue masses compressing the spinal cord such as infiltrative lipomas. Radiographs led to suspicion of a neoplastic lesion in 1 dog, but did not provide definitive findings. Computed tomography (CT) was not performed. In 1 report, an infiltrative lipoma invading the pelvic canal and tendon sheath in a dog was diagnosed by CT scan (9,5,16). In both cases described here the MR imaging showed high signal intensity (hyperintensity) of the masses in T1- and T2-weighted sequences. The muscles and the mass lesions were both characterized by high signal intensity. Noticeably, both neoplasms were in the distal thoracic region and without any indication, such as a lump or swelling, at the surface of the body. In case 1, the neoplasia was in the region of Th9/10 with severe extradural compression of the spinal cord to the left side over a length of 2.0 cm. The muscles involved showed a mild contrast enhancement. The dog in Case 2 had extradural compression of the spinal cord in the region of Th10/11. The adjacent paraspinal muscles were characterized by high signal intensities in T2-weighted images. In both dogs, these muscles showed a moderate contrast enhancement which could indicate local inflammation.

To corroborate these findings a fat saturation sequence (SPAIR) was chosen. The SPAIR is a powerful technique for fat suppression which offers advantages over conventional fat suppression techniques. This technique suppresses/inverts only fat spins and uses a spectrally selective adiabatic inversion pulse to invert the fat spins in the imaging volume. Due to this suppression the fat spins do not contribute to the MR signal. Thus, fat appears hypointense (17). In this SPAIR sequence both neoplasms had the same appearance as fat, supporting the tentative diagnosis of an infiltrative lipoma.

Unfortunately, the owners of both dogs elected euthanasia due to the guarded prognosis. There are 2 reports, however, of large-breed dogs with infiltrative lipomas compressing the spinal cord that underwent surgery and had satisfactory results (9,10). Those dogs did not show severe neurological deficits. Thus, surgery might be a therapeutic option for infiltrative lipomas compressing the spinal cord because it can be curative if the infiltrative lipoma can be completely excised. In a retrospective study of infiltrative lipomas in different parts of the body, Bergman et al (2) showed that only 5 dogs out of 13 had recurrence after aggressive surgical excision, while the other 8 dogs were cured. Among 16 tumors, 5 were located in the hind limb, 3 in the forelimb, 2 in the perianal area, 1 in the pericocular region, 1 adjacent to the coxofemoral joint, 1 in the lateral thoracic area, 1 lateral to the mandible, 1 adjacent to the caudal thoracic vertebrae, and 1 in the ventrolateral abdominal wall (2). Despite the good prognosis, adjuvant therapy is advisable. Ogilvie et al (7) reported a dog treated with doxorubicin for an infiltrative lipoma with a documented partial response within 6 wk. Survival time of dogs treated with radiation alone, before and after surgery is reported by McEntee et al (8). The patient survival time ranged from 6 to 94 mo (median of 40 mo) and 92% of the dogs benefited from radiation therapy (8).

In the histopathological examination, mitotic figures were not detected in either case. These findings confirmed the diagnosis of an infiltrative lipoma as these neoplasms do not produce mitotic figures and are characterized by well-differentiated adipocytes. These 2 cases of infiltrative lipomas causing the spinal cord and causing severe neurological deficits show that MR imaging is a sensitive diagnostic tool for soft tissue neoplasms such as infiltrative lipomas when the spinal cord is involved (2). Spinal cord compression by infiltrative lipomas, as described here, is extremely rare. For surgical planning the MR imaging is irreplaceable, as the margins of the neoplasm can be depicted as precisely as possible by this technique. Magnetic resonance imaging can be helpful to distinguish lipomas from infiltrative lipomas and a special fat saturation sequence, such as the SPAIR sequence, can provide the evidence that the neoplasms were of fatty origin. (cv)

References

Brief Communication

Respiratory disease outbreak in a veterinary hospital associated with canine parainfluenza virus infection

J. Scott Weese, Jason Stull

Abstract — A cluster of canine parainfluenza virus infections was identified in a veterinary referral hospital. While hospital-associated outbreaks of canine parainfluenza virus infection have not been previously reported, veterinary hospitals possess some of the same risk factors that may be present in traditional high-risk sites such as kennels. Hospital-associated transmission of canine respiratory pathogens, therefore, must be considered.

Hospital-associated (HA) infections are an ever-present risk in veterinary healthcare facilities, and there has been increasing concern about these infections in recent years, largely due to the emergence and dissemination of multidrug resistant pathogens such as methicillin-resistant staphylococci and multidrug resistant Gram-negative bacteria (1–4). There are limited reports of HA transmission and outbreaks of other pathogens such as Clostridium difficile (5) and Salmonella (6,7) but a wide range of potential HA pathogens can be encountered.

Canine infectious respiratory disease complex (CIRDC) (previously referred to as infectious tracheobronchitis or kennel cough) is a syndrome that can be caused by a variety of pathogens, most notably canine adenovirus type 2, canine parainfluenza virus (CPiV), canine influenza, canine herpesvirus, canine respiratory coronavirus, Bordetella bronchiseptica, Streptococcus zooepidemicus, and Mycoplasma spp., sometimes in combination (8,9). This disease complex (CIRDC) typically causes mild to moderate, self-limiting upper respiratory tract infection, mainly characterized by cough with a relatively small percentage of cases developing complications such as pneumonia. Fatal infections are uncommon (8).

On September 20, 2011, a 1-year-old male castrated standard poodle dog was presented to the Ontario Veterinary College Health Sciences Centre (OVC-HSC) for an ophthalmological examination (Figure 1). He was an otherwise healthy dog that had been vaccinated against canine distemper, canine adenovirus type 2, CPiV, canine parvovirus (DA2PP) with a 3-dose parenteral series on February 28, March 30, and May 12, 2011. He had not recently been at a kennel or shelter, but had direct contact with other dogs at a dog park 5 days earlier and had been at a grooming facility 4 days earlier. No evidence of respiratory disease was present at initial examination. He was housed in a general hospital ward in a floor-level cage and discharged later that day. On September 24, 2011, he was re-admitted for examination of an acute onset of fever and cough. He was housed in an isolation unit during this visit and handled with contact barrier precautions. Radiographic changes suggestive of bacterial pneumonia were noted, as was esophageal dilation. Empirical treatment with amoxicillin/clavulanic acid (Clavamox, Pfizer, Mississauga, Ontario), 14 mg/kg body weight (BW), PO, q12h for 10 d was initiated. Pasteurella sp. susceptible to amoxicillin/clavulanic acid was isolated from a pharyngeal swab, although given the sampling site, the relevance was unclear. At recheck, 10 days later, the dog was improving both clinically and

Department of Pathobiology (Weese, Stull) and Centre for Public Health and Zoonoses (Weese), Ontario Veterinary College, University of Guelph, Guelph, Ontario N1G 2W1. Address all correspondence to Dr. J. Scott Weese; e-mail: jswese@uoguelph.ca

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radiographically. Esophageal dilation was no longer present. Full recovery, occurring approximately 6 wk after disease onset, was subsequently uneventful.

Dog 2, a 1-year-old spayed female bulldog, was hospitalized September 19 to 23 because of diffuse urticaria of unknown origin. The dog had diarrhea, pyrexia, facial swelling, and hives. It had received an appropriate initial series of DA2PP in 2010 and a booster on June 4, 2011. No signs of respiratory disease were identified. It was housed in the same ward in which Dog 1 had spent the day during its initial visit (September 20), in a floor-level cage approximately 3 m from Dog 1. Brief nose-to-nose contact with Dog 1 occurred through the cage bars when Dog 1 was walked through the ward. On September 25, 5 days after exposure to Dog 1, there was an acute onset of cough without fever. As with dog 1, this dog was isolated immediately upon re-admission on September 25 and handled with contact barrier precautions. Thoracic radiographs were unremarkable. Treatment with hydrocodone (Pharmascience, Montreal, Quebec), 0.2 mg/kg BW, PO, q6h for 14 d and doxycycline (Apo-Doxy; Apotex, Toronto, Ontario), 20 mg/kg BW, PO, q12h for 10 d was administered. Recovery was uneventful, with cough persisting for approximately 14 d.

Dog 3 was a 1-year-old male standard poodle which was a littermate to Dog 1 but owned by a separate owner in a different household. The dog was at the OVC-HSC on September 20 for castration and was housed in a different ward; however, contrary to facility policy, it was allowed to play with Dog 1 in its run for approximately 5 min on September 20. It had received an appropriate initial DA2PP series, with the 3rd dose administered on May 25, 2011. Cough was noted on September 26 and Dog 3 was presented for examination on September 28. The dog was housed in isolation and handled with contact barrier precautions. Harsh coughing was the only clinical abnormality. Thoracic radiographs were normal. Doxycycline and hydrocodone were prescribed as for Dog 2. Clinical signs abated after 3 d.

Dog 4 was a 12-year-old castrated male cocker spaniel dog that was hospitalized September 20 to 21 for surgical excision of a limb mass and was housed in the same ward as Dog 1 in a floor-level cage approximately 2 m from Dog 1. No direct contact with Dogs 1, 2, or 3 was recalled by hospital personnel; however, it cannot be completely excluded. Dog 4 had received its triennial vaccination booster, which included CPiV, 3 wk prior to presentation. Coughing was reported to have started on September 25. The dog was returned for collection of diagnostic samples, but because disease was mild, he was not admitted and no further diagnostic testing was performed. No treatment was prescribed and no complications developed.

Dog 5 was not at the OVC-HSC but was a suspected secondary case. This dog was owned by the neighbor of Dog 2 and there was periodic direct contact between the dogs in their yards. This dog was suspected to have had contact with Dog 5 on September 24 and had an onset of cough on October 3. No further clinical information was available.

An infection control response was initiated on September 26 immediately after reports of potential infections of dogs 2 and 3. The ward that had housed dogs 1, 2, and 4 was identified and quarantined. Patient follow-up was intensified and monitoring of hospitalized patients for signs of respiratory disease or fever of unknown origin was increased. Acute and convalescent serum samples were collected from dogs 1–4 and tested for canine influenza and CPiV antibodies by hemagglutination inhibition. Nasal swabs were also collected for canine influenza polymerase chain reaction (PCR) and pharyngeal swabs were collected for aerobic bacterial culture. Canine parainfluenza infection was diagnosed through identification of a 4-fold or greater increase in CPiV antibody titer in all tested dogs (Table 1). Antibodies against canine influenza were not detected on acute or convalescent samples and canine influenza virus PCR was negative. No bacterial pathogens were identified. No samples were collected from dog 5.

Canine parainfluenza virus is an enveloped RNA virus that belongs to the Paramyxoviridae family (12). It is highly contagious, being excreted from the respiratory tract of acutely infected animals, and is an important component of CIRDC (10,12,13). Signs of disease typically occur 2 to 8 d after exposure (12), and the typical clinical presentation is the presence of a dry, hacking cough that persists for 2 to 6 d (14). Nasal discharge, pharyngitis, and tonsillitis may also be present, but pyrexia is usually mild or absent (12,14). Viral shedding typically starts 2 to 10 d after exposure and typically begins prior to the onset of clinical signs (12,14). Therefore, while the clinical syndrome of CIRDC is readily identifiable, not all dogs shedding the causative agents display signs of infection. CPiV is highly transmissible and infection rates among exposed susceptible individuals are high (15,16). Transmission is predominantly through infectious aerosols, although the role of fomites may be underestimated (14). There is no long-term carrier state.

Table 1. Canine parainfluenza virus specific antibody titers as determined by hemagglutination inhibition

<table>
<thead>
<tr>
<th>Dog</th>
<th>Acute</th>
<th>Convalescent*</th>
<th>Titer increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1:384</td>
<td>1:1536</td>
<td>4-fold</td>
</tr>
<tr>
<td>2</td>
<td>1:32</td>
<td>1:1536</td>
<td>48-fold</td>
</tr>
<tr>
<td>3</td>
<td>1:96</td>
<td>1:1536</td>
<td>16-fold</td>
</tr>
<tr>
<td>4</td>
<td>1:96</td>
<td>1:512</td>
<td>5.3-fold</td>
</tr>
</tbody>
</table>

* Collected 10 to 14 d after acute phase samples.
Given the common involvement of CPIV in CIRD and the potentially large number of dogs in close proximity in veterinary hospitals, either as outpatients in common areas or as inpatients, it is perhaps surprising that there are few reports of HA-CIRD, particularly in light of the widespread reports of human PiV outbreaks in human hospitals (17–19). It is unclear whether this is because they rarely occur (perhaps because a vaccine is available for dogs, as opposed to humans), are rarely diagnosed or are rarely reported. Under-identification could certainly be possible considering the infrequent testing of dogs with respiratory disease, the likelihood that onset of disease would be in the community (and therefore be less likely to be recognized by veterinary hospitals), and the possible reluctance of facilities to report HA infections. Regardless, this report indicates that CPIV transmission can occur within a veterinary facility, including between dogs with no known direct contact.

The origin of CPIV in this case series cannot be definitively established. The 4 to 6 day onset of clinical signs after exposure of Dogs 2–4 to Dog 1 is consistent with CPIV infection acquired during hospitalization. No other cases of potentially infectious respiratory disease were identified in dogs at the OVC-HSC in the preceding month. Considering the typical incubation period (with the potential for shedding of CPIV for 4 or more days prior to the onset of disease) (14), the timing of this dog’s exposure to other dogs of unknown health status at the grooming facility or dog park is consistent with exposure at that time. However, it cannot be definitively established that this was the index case or that the dog park or grooming facility was the origin of infection.

Two of the 3 dogs (dogs 2 and 3) with HA-infections had direct, albeit relatively short-term, contact with the index case (Dog 1). This was against standard hospital infection control protocols and highlights the need for preventing contact between animals within facilities. Certainly, one cannot guarantee that transmission would not have occurred if direct contact was prevented, particularly since one other affected dog had no known direct contact; however, the closeness and duration of contact are presumably key factors in determining the likelihood of pathogen transmission. Indirect transmission via personnel, from hands or clothing, must also be considered. There was no overlap in clinical personnel between the 4 dogs; however, it is possible that kennel staff handled both dogs. General environmental fomites must also be considered, but items that might have been used on multiple dogs were not identified. Environmental exposure from sites contaminated by Dog 1 such as hallways or the dog walking area is also possible but unlikely. The authors are unaware of data describing environmental persistence of CPIV; however, being an enveloped virus, CPIV would not be expected to persist for a prolonged length of time and would be readily inactivated by accelerated hydrogen peroxide, the disinfectant used at this facility. Environmental infection was therefore considered unlikely given the greater potential of aerosol or personnel-borne transmission and the lack of infections identified in dogs outside of that ward that did not have direct contact with the index case.

While no testing was performed to confirm CPIV infection in Dog 5, it was considered a suspected case based on exposure to Dog 4 in the community and a timeframe and clinical presentation consistent with CPIV infection. The dog was exposed 9 d prior to the onset of clinical signs, which is near the end of the incubation period window, but transmission from Dog 4 is certainly possible.

In this outbreak, all of the suspected HA-associated transmission occurred before the onset of disease in the first case. First generation transmission (transmission of the infectious agent from the index case to the first group of subsequent cases) can be difficult to prevent with a virus that can be shed prior to the onset of clinical signs. However an outbreak assessment is critical to determine if any measures could have prevented transmission in some or all cases. The breaches of standard infection control practices, with direct contact allowed between dogs 1, 2, and 3, may have played a role in this outbreak. Once the outbreak was recognized, no further cases were identified. This may have been, in part, because of the short duration of hospitalization of the index case; however, immediate isolation of dogs upon re-admission and enhancement of infection control practices may have played a role. Despite a lack of proof of efficacy of outbreak interventions, these data suggest that a rapid yet practical response may help contain this infectious agent within a facility. Second generation transmission was suspected outside of the hospital, with potential infection of a neighbor’s dog (Dog 5). While not involving the hospital, this is of concern because of the potential for facilitating further community spread of CPIV. Although in this situation Dog 4 was not showing signs of illness when it was permitted to interact with Dog 5, the suggested occurrence of disease spread into the community highlights the importance of counseling owners of infectious animals that are being discharged from hospitals.

Modified live CPIV is included in common parenteral vaccines. While CPIV is not itself considered a “core” vaccine component (20), the other agents in the combination vaccine are; therefore, CPIV vaccination is common. Dogs 1–4 had been vaccinated appropriately, with boosters within the preceding 5 mo. Parenteral vaccination is used to prevent clinical disease but has not been shown to have an impact on CPIV shedding and does not confer absolute protection from disease, as was evident here. Intranasal CPIV vaccines are also available in combination with other CIRD agents, and this approach is preferable because it can have a greater impact on both disease and viral shedding (21). These are not part of the recommended “core” canine vaccines (20), typically being reserved for dogs at perceived higher risk for exposure (e.g., dogs going to kennels) and had not been administered to any of these dogs.

This outbreak of CPIV infection should serve as a reminder of the ever-present risk of HA-infections, including outbreaks that originate from clinically normal individuals. Prompt recognition of potential outbreaks, the presence of a good standard infection control program, and the implementation of enhanced infection control practices may be important to reduce the impact on patients and the hospital.

Acknowledgment
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Books Available for Review
Livres disponibles pour compte rendu

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5. Govaere J, Martens K, de Kruijff A. *Foal in Mare — Insights inside the foaling mare, 2nd edition*. Department of Reproduction, Obstetrics, and Head Health, Faculty of Veterinary Medicine, Ghent University, 2011 CD.


Case Report  Rapport de cas

Postsurgical segmental mesenteric ischemic thrombosis in a horse

María Martin-Cuervo, Luis A. Gracia, Verónica Vieitez, Joquin Jiménez, Esther Durán, Luis J. Ezquerra

**Abstract** — A 16-year-old, Lusitanian stallion was admitted to the Veterinary Teaching Hospital with a 12-hour history of signs of abdominal pain. Exploratory celiotomy was performed due to an inguinal hernia, and a second celiotomy was performed in response to the abdominal pain. The horse was euthanized and mesenteric venous thrombosis was diagnosed and considered likely due to peritonitis and systemic inflammatory response syndrome (SIRS).

**Résumé** — Thrombose ischémique mésentérique segmentaire post-chirurgicale chez un cheval. Un étalon Lusitanien âgé de 16 ans a été admis à l’hôpital d’enseignement vétérinaire avec une anamnèse de 12 heures de douleurs abdominales. Une coeliotomie exploratoire a été réalisée en raison d’une hernie inguinale et une deuxième coeliotomie a été réalisée en réponse à la douleur abdominale. Le cheval a été euthanasié et une thrombose de la veine mésentérique a été diagnostiquée et considérée probablement attributable à une péritonite et au syndrome de la réaction inflammatoire systémique (SRIS).


**Case description**

A 16-year-old, Lusitanian stallion was admitted to the Veterinary Teaching Hospital of the University of Extremadura with a 12-hour history of signs of abdominal pain. Initial findings on physical examination included enlargement of the left testicle, heart rate of 58 beats/min (bpm), respiratory rate of 20 breaths/ min, temperature 36.9°C, and abdominal sounds decreased on both sides. Transabdominal ultrasonography identified distended loops of small intestine in the lower caudal portion of the abdomen and in the left inguinal ring.

Results of laboratory tests indicated that the horse had mild serum hyperlactacidemia (2.1 mmol/L, reference value: < 2 mmol/L), hyperbilirubinemia [78.5 μmol/L; reference interval (RI): 8.6 to 35.9 μmol/L], and hyperfibrinogenemia (24.8 μmol/L; RI: 5.9 to 11.8 μmol/L). Analysis of peritoneal fluid revealed hyperlactacidemia of 3.1 mmol/L (reference value: < 2 mmol/L) as the only abnormality detected.

Exploratory celiotomy revealed a strangulated nonreducible inguinal hernia. The hernia was corrected through an inguinal incision over the external inguinal ring. A ventral midline celiotomy was performed to allow intra-abdominal traction on the bowel. The segment affected was the distal part of the jejunum, about 20 cm cranial to the ileum. A routine castration of the left testicle was done. The appearance of the bowel didn’t improve after correction of the strangulation and decompressing distended small intestine by massaging fluid out of it; therefore, jejunointestinalostomy was performed after resection of approximately 73 cm of jejum. A sterile Penrose drain was applied 20 cm proximal to the anastomosis site. The end-to-end anastomosis was closed by a two-layer continuous pattern with polyglycolic acid Safil® 3-0 (Braun Aesculap, Barcelona, Spain) for the submucosa and mucosa, followed by a Cushing pattern in the seromuscular layer. The vessels were sealed by the LigaSure® (Valleylab, Tyco International Healthcare, Boulder, Colorado, USA) vessel sealing system. Before closing the abdominal incision, the small intestine was decompressed by massaging its contents into the cecum. After the surgery the entire intestine was normal in color, had peristalsis, and was not distended. The linea alba was closed with polyglycolic acid, Safil® 5 suture material (Braun Aesculap) in a continuous pattern. Subcutaneous tissue was closed with polyglycolic acid Safil® 2/0 (Braun Aesculap) in a continuous pattern and the skin was closed with staples.

Treatment consisted of Lactated Ringer’s solution administered IV with calcium and potassium chloride at a maintenance rate, flunixin meglumine (FINADYNE; Shering Plough SA, Madrid, Spain), 0.5 mg/kg body weight (BW), q12h, polymixin B (Polimixina, Oristá, Barcelona, Spain), 5000 IU/kg BW, q12h, lidocaine (Lidocaína Braun, B. Braun Medical SA, Rubí, Spain), 0.05 mg/kg BW per minute, benzyl penicillin sodium (Penilevel; ERN, Barcelona, Spain), 22 000 IU/kg BW, q6h, gentamicin (Ganadexil; INVESA, Esplugues de Llobregat, Spain), 6.6 mg/kg BW, q24h, erythromycin (Pantomicina;
CEVA Salud Animal, Barcelona, Spain), 2.2 mg/kg BW, q6h, and omeprazole (GASTROGARD; Mérial, Lugo, Spain), 4 mg/kg BW, q24h. The stallion recovered from surgery without reflux and pain but subsequently signs of pain developed and the stallion began refluxing gastric contents 3 d after surgery. At this time, the heart rate was 80 bpm, the respiratory rate 28 breaths/min, and abdominal sounds decreased on both sides. The mucous membranes were congested (dark red).

Hematologic analyses revealed a peripheral white blood cell (WBC) count of 3.5 × 10³/µL, (RI: 6 to 12 × 10³/µL), hematocrit of 48.4% (RI: 32% to 48%) and total protein of 40 g/L (reference range: 53 to 73 g/L). Serum biochemical abnormalities included high fibrinogen concentration (25.0 µmol/L), slightly high creatinine concentration (176.8 µmol/L; RI: 44.2 to 150.3 µmol/L), high total bilirubin concentration (211.0 µmol/L), slightly high lactate concentration (2.4 mmol/L) and low potassium concentration (2.3 mEq/L; RI: 3 to 5 mEq/L).

Abdominocentesis yielded peritoneal fluid with a total protein concentration of 40 g/L (reference value: 25 g/L), WBC count of 27 600/mm³ (RI: 500 to 5000/mm³), lactate concentration of 7.6 mmol/L (reference value: < 2.5 mmol/L), and glucose concentration 0.89 mmol/L (RI: 4.2 to 7.1 mmol/L).

After the results of the tests had been examined, and because of persistent signs of abdominal pain, an exploratory celiotomy was performed (3 days after the first one), which revealed several thrombi in the mesenteric veins. The small intestine had several infarcts and extensive lesions (Figure 1). There were 3 separate affected segments each longer than 1 m. The anastomosis site was not affected and was separated by about 5 m from the first affected segment. It was suspected, however, that there might have been a leak at the anastomosis site, which caused the peritonitis. Severe peritonitis and intestinal ischemia were confirmed at surgery. Due to the seriousness of the lesions the horse was euthanized and samples were submitted for histopathological studies (Figures 2 and 3).

Discussion
Mesenteric venous thrombosis (also known as visceral venous thrombosis) is a rare but lethal form of mesenteric ischemia in humans (1). Warren and Eberhard (2) reported that intestinal infarction resulted from ischemia due to venous thrombosis, and they reported a mortality rate of 34% in human patients with venous thrombosis after resection. The concept of Virchow’s triad explains the disease as a secondary complication after endothelial lesions, flow alterations, or hypercoagulation states. Mesenteric ischemia (MI) can be classified as acute (AMI) or chronic (CMI) depending on the progression of clinical signs (3). As well, there are classifications according to the origin (arterial or venous) and physiopathology (obstructive or not obstructive) (4). Traditionally, AMI was associated with low output cardiac flow, decreases in blood flow, and/or hypovolemic shock (5).

The risk of acute mesenteric venous thrombosis increases in human patients with hypercoagulable states (e.g., polycythemia vera, protein C and S deficiencies) (6–8), visceral infection (9), portal hypertension (10), perforated viscus (11), blunt abdominal trauma (12), malignancy (13), and previous abdominal surgery (open or laparoscopic) (14,15). High mortality (20% to 50% in humans) might be due to late diagnosis and presence of factors such as disseminated intravascular coagulation (DIC) or systemic inflammatory response syndrome (SIRS) (16). Horses usually develop thrombosis secondary to migration of
larvae of *Strongyulus vulgaris* (17,18) and rarely thrombosis may be a cause of rectal perforation (19). Parker et al (20) reported 2 cases of infarction of segments of intestine other than at the site of obstruction of the primary celiotomy in a retrospective evaluation of repeat celiotomies in 53 horses, but they didn’t specify whether it was as a consequence of venous or arterial thrombosis. Other authors described vascular injury associated with strangulating obstructions of the equine large colon such as thrombosis of the mesenteric colic vessels (21). Intestinal infarction has been associated with mesenteric vascular thrombotic thrombosis (22). No parasites were observed in this horse and the possible causes of AMI were peritonitis and SIRS.

We recommend that postsurgical segmental mesenteric ischemic thrombosis be included in the differential diagnoses of abdominal pain after surgery. Horses with small intestine diseases or peritonitis might be susceptible to developing secondary thrombosis.

References

Diagnostic Ophthalmology
Ophtalmologie diagnostique

Bruce H. Grahn, Bianca Bauer, Tawni Silver

History and clinical signs

A 7-year-old female boxer dog was examined by the ophthalmology service at the Western College of Veterinary Medicine with a history of acute onset blindness of approximately 1 month. Vaccinations for distemper, parvo, and rabies viruses were current. Our neuro-ophthalmic examination revealed that bilateral mydriasis and the pupillary reflexes and menace responses were absent; palpebral and oculocephalic reflexes were present bilaterally. Photopic and scotopic maze testing was completed and the dog was unable to navigate the obstacle course. Schirmer tear tests (Schirmer Tear Test Strips; Alcon Canada, Mississauga, Ontario) values were approximately 20 mm/min bilaterally. The intraocular pressures, estimated with a rebound tonometer (TonoVet; Tiolat Oy, Helsinki, Finland), were 16 and 17 mmHg in the right and left eye, respectively. Biomicroscopic (Ostram 64222; Carl Zeiss Canada, Don Mills, Ontario) and indirect ophthalmoscopic (Heine Omega 200; Heine Instruments Canada, Kitchener, Ontario) examinations were completed and no significant abnormalities could be detected. Corneal dystrophy was present; however, it was mild and had been present for several years and was not progressing. A routine photopic electroretinogram was completed and the a-waves were 35 microvolts and the b-waves were approximately 115 microvolts; these values are within normal reference ranges for a dog of this age (Figure 1).

What are your clinical diagnoses, differential diagnoses, diagnostic plan, and prognosis?

Our clinical diagnoses were blindness, and afferent pupillary defects which are consistent with optic nerve and optic chiasmal disorders including central nervous system neoplasms and inflammatory conditions including optic neuritis. A physical examination, complete blood cell count, serum biochemical profile, and urinalysis were completed; no significant abnormalities were detected. Routine sedation and general anesthesia were advised and contrast enhanced computerized tomography (CT scan) with iohexol, (Omnipaque; GE Health Care Canada, Mississauga, Ontario) of the cranium was done.

Discussion

The CT images reveal a contrast enhancing extra axial tumor in the ventral brain which involves the optic chiasma and optic nerves (Figure 2). The tumor is creating mechanical obstruction of the third ventricle with secondary third and lateral ventricular enlargement. A dural tail sign (meningial enhancement) was not noted on the CT images. The appearance is most consistent with a neoplasm and meningioma, glioma, astrocytomas, and several metastatic neoplasms may be considered. The prognosis for this dog is guarded and external beam radiation was offered but declined. The owner declined further therapy and the dog is being managed conservatively.

Neoplasms of the optic chiasmal neoplasia are a relatively uncommon cause of blindness in animals. However, its importance rises quickly in our differential diagnoses list when the electroretinogram and ophthalmoscopic examinations are within normal limits. These evaluations rule out intraocular disorders that commonly induce blindness including but not limited to cataracts, retinal detachments, and retinal degenerations. Sudden acquired retinal degeneration (SARD) is by far the most common cause of acute blindness in middle-aged dogs without clinically apparent intraocular lesions that could impair vision. SARD is confirmed by electroretinography which reveals no
retinal activity. In this dog, the retinal electrical activity was within normal limits, which mandates sectional imaging of the optic nerves and chiasma to determine an etiologic diagnosis. The most common etiologies for these dogs are either optic chiasmal neoplasia or optic neuritis. These disorders can be differentiated by the sectional imaging manifestations. This dog manifested with a large tumor that was centered on the optic chiasma with extension down the optic nerves.

Unfortunately we were unable to confirm the type of neoplasms that invaded this optic nerve or attempt therapy such as external beam radiation. Optic nerve meningioma was considered one of the most likely primary neoplasms; however, many other primary and metastatic neoplasms are possible (1,2).

In conclusion, acute blindness in the absence of ophthalmoscopic detectable vision impairing lesions warrant an electroretinogram to confirm or negate SARD. When SARD has been ruled out, contrast enhanced sectional imaging (MRI or CT scans) is required to establish the diagnosis for afferent pupillary defects.

References
Associate veterinarian salaries continue to rise
La hausse des salaires des vétérinaires se poursuit

Darren Osborne, Simon Miller

Associate veterinarian salaries were up in most provinces for 2012 despite lagging veterinary economies last year. Last year, many practices posted negative client growth and stagnating revenues, but associate veterinarian salaries seemed to have risen above the clamor to come out not only positive in most provinces, but ahead of inflation. Nationally, salaries increased 2%, while inflation rose only 1.2%

The response rate to the economic survey was the first give-away that good news was on the way. In past years, the response to associate veterinarian surveys usually lingered around 20% with a greater number of responses coming from the least populated provinces. This year, response rates exceeded 50% in 3 provinces (Saskatchewan, Nova Scotia, and New Brunswick) and the lowest response rate from any province was still a very respectable 29%. The provinces with the fewest responses were Alberta (29%), Quebec (30%), and Newfoundland (31%). The national response rate was 36% (Table 1).

In Ontario, allowances were made to calculate response rates based on CVMA and OVMA memberships, since 98% of responses came from members in one of the two groups. Information was not available to calculate the response rate from associate veterinarians in British Columbia since the survey was only distributed to those associate veterinarians who are CVMA members and there were no data available on the total number of associate members in the province. The national figures assume the response from British Columbia would match the national median.

Information for the survey was submitted anonymously. Since individual responses cannot be cross-referenced, the survey reports the “median” figures. The median is obtained by ranking

E n 2012, les salaires des vétérinaires étaient en hausse dans la plupart des provinces, malgré la perte de vitesse des finances vétérinaires de l’an dernier. Au cours de la dernière année, beaucoup de pratiques ont affiché une croissance négative de la clientèle et ont connu un chiffre d’affaires stagnant, mais les salaires des vétérinaires semblent s’être hissés au-dessus du brouhaha pour une croissance non seulement positive, mais supérieure au taux d’inflation À l’échelle nationale, les salaires ont augmenté de 2 %, tandis que l’inflation a progressé de seulement 1,2 %.

Le taux de réponse au sondage économique était le premier indice de l’arrivée de bonnes nouvelles. Au cours des années précédentes, le taux de réponse aux sondages pour les vétérinaires salariés se situait autour de 20 % avec un nombre supérieur de réponses provenant des provinces les moins peuplées. Cette année, les taux de réponse dépassaient 50 % dans trois provinces (Saskatchewan, Nouvelle-Écosse et Nouveau-Brunswick) et le taux de réponse le plus faible d’une province s’établissait à un pourcentage très respectable de 29 %. Les provinces avec les taux de réponse les plus bas étaient l’Alberta (29 %), le Québec (30 %) et Terre-Neuve (31 %). Le taux de réponse national était de 36 % (tableau 1).

En Ontario, on a effectué le calcul des taux de réponse en fonction de l’adhésion à l’ACMV et à l’OVMA, vu que 98 % des réponses provenaient de membres de l’un des deux groupes. Des données n’étaient pas disponibles pour calculer le taux de réponse des vétérinaires salariés de la Colombie-Britannique vu que le sondage a seulement été distribué aux vétérinaires salariés qui sont membres de l’ACMV et qu’il n’y avait pas de données disponibles sur le nombre total de membres salariés dans la
all responses from smallest to largest and then taking the midpoint. The advantage of using the median for anonymous surveys is that the results are not influenced by extreme responses.

To account for the difference in the cost-of-living from one province to another, associate veterinarian wages were adjusted using a multiplier that reflects the cost-of-living in each province (1). For example, households spend more in Ontario and Alberta than they do in Newfoundland or Prince Edward Island so an associate veterinarian earning the median Canadian salary of $81,637 would have more spending power in Newfoundland or Prince Edward Island, where household expenses are lower.

The survey was distributed electronically to members using e-mails provided by the provincial associations and the CVMA. Members were sent multiple weekly reminders encouraging participation. Respondents were asked to report on current figures and project incomes for the full calendar year. Associate veterinarians who were paid on production reported on cases over the last 12-month period. The salaries reported in this article represent salaries for the current year — 2012. Nationally, the figures are accurate to +/- 1.5%, 19 times out of 20.

The 2012 Associate Veterinarian Survey of Compensation and Benefits is a member service provided by provincial Veterinary Medical Association and the Canadian Veterinary Medical Association. Each year, the CVMA, in cooperation with the provincial VMAs and support from industry sponsors, Petsecure, Merck, and Scotiabank survey associate veterinarians in each province to determine the level of compensation and benefits by province.

Seven out of 10 provinces saw associate veterinarian salaries increase in 2012 (Table 2). Saskatchewan had a slight decrease in salaries from $75,000 to $74,500 and associate veterinarians in Nova Scotia and New Brunswick experienced zero growth in annual salaries. There was a tight cluster of median increases in other provinces ranging from 2% to 4% with the predominant increase being just ahead of inflation at 3%. Newfoundland and Labrador reported an extraordinary increase in salaries, province. Les données nationales présument que la réponse de la Colombie-Britannique correspondrait à la médiane nationale. Les données du sondage ont été soumises anonymement. Vu qu’une correspondance ne peut pas être établie entre les réponses individuelles, le rapport présente les données «médianes». La médiane est obtenue en classant toutes les réponses, de la plus faible à la plus élevée, puis en prenant la donnée du milieu. L’avantage de l’utilisation de la médiane pour les sondages anonymes est que les résultats ne sont pas influencés par des réponses extrêmes.

Pour tenir compte de la différence du coût de la vie d’une province à l’autre, les salaires des vétérinaires ont été ajustés en utilisant un multiplicateur qui reflète le coût de la vie dans chaque province (1). Par exemple, les ménages dépensent plus en Ontario et en Alberta qu’à Terre-Neuve ou à l’Île-du-Prince-Édouard, et un vétérinaire salarié gagnant le salaire canadien moyen de 81 637 $ aurait donc plus de pouvoir d’achat à Terre-Neuve ou à l’Île-du-Prince-Édouard, où les dépenses des ménages sont inférieures.

Le sondage a été distribué électroniquement aux membres en utilisant les adresses de courriel fournies par les associations provinciales et l’ACMV. De nombreux rappels hebdomadaires ont été envoyés aux membres en les encourageant à participer. Nous avons demandé aux répondants de déclarer les chiffres actuels et de projeter les revenus pour l’année civile complète. Les vétérinaires salariés qui étaient rémunérés en fonction de la production ont présenté des rapports sur les cas examinés au cours des 12 derniers mois. Les salaires présentés dans le présent article représentent les salaires de l’année en cours — 2012. À l’échelle nationale, les données sont exactes à +/- 1,5 %, 19 fois sur 20.

Le Sondage 2012 sur la rémunération et les avantages sociaux des vétérinaires salariés est un service aux membres fourni par chaque association de médecins vétérinaires (AMV) provinciale et par l’Association canadienne des médecins vétérinaires. Chaque année, en collaboration avec les AMV provinciales et
but this may be attributed to fewer responses and lower overall sample size. The median national increase was calculated using a weighted median based on the response from each province so the figures from Newfoundland and Labrador did little to affect the national figures.

The coastal provinces reported the highest median salaries which were within $750 of each other. Newfoundland and Labrador posted a median associate veterinarian salary of $85 750 and British Columbia reported $85 000. Along with Alberta at $83 000, these were the only provinces that exceeded the national median income.

After adjusting for the cost-of-living in each province, Newfoundland and Labrador continued to dominate the landscape with the highest salaries in the country, even without the extraordinary leap in incomes last year. If one used the figures from Newfoundland and Labrador last year and adjusted for the cost-of-living, it would still hold the podium on provincial incomes.

The only other provinces that exceeded the national median income after adjusting for the cost-of-living were Manitoba and New Brunswick (Figure 1). Both provinces were almost $1000 higher than the national median figure.

The “have” provinces, Ontario and Alberta, lagged behind all other provinces in cost-of-living adjusted salaries. Echoing past years’ results, Alberta associate veterinarian salaries failed to gain ground on the highest cost-of-living in the country. Practice owners made valiant attempts to keep pace offering the highest year over year increase outside of Newfoundland and Labrador and posted the third highest incomes before the cost-of-living adjustment. This, however, was not enough to offset the cost-of-living differences. Ontario posted higher than average increases as well but started out below the national average and as a result, associate veterinarian salaries hit second from the bottom after the cost-of-living adjustment.

For a complete report on associate veterinarian salaries along with breakdowns of benefits and vacation time for associate.

grâce au soutien des commanditaires de l’industrie, Petsecure, Merck et Banque Scotia, l’ACMV procède à un sondage auprès des vétérinaires salariés de chaque province pour déterminer le niveau de la rémunération et des avantages sociaux selon la province.

Dans sept provinces sur dix, les salaires des vétérinaires ont augmenté en 2012 (tableau 2). La Saskatchewan a affiché une légère baisse des salaires, de 75 000 $ à 74 500 $, et les vétérinaires salariés de la Nouvelle-Écosse et du Nouveau-Brunswick ont connu une croissance zéro du salaire annuel. Il y avait un groupe serré de maisons médianes dans les autres provinces s’échelonnant de 2 % à 4 % et l’augmentation dominante se situait à peine au-dessus de l’inflation à 3 %. Terre-Neuve et Labrador a déclaré une augmentation extraordinaire des salaires, mais cela peut être attribué à un nombre de réponses inférieur et à un échantillon global réduit. La hausse médiane nationale a été calculée en utilisant une médiane pondérée basée sur le taux de réponse dans chaque province et les données de Terre-Neuve et Labrador n’ont donc pas affecté les données nationales.

Les provinces côtières ont signalé les salaires médians les plus élevés, qui présentaient tous un écart de 750 $ entre eux. Terre-Neuve et Labrador a affiché un salaire médian de 85 750 $ pour les vétérinaires salariés et la Colombie-Britannique a signalé un salaire de 85 000 $. Avec l’Alberta, qui se situe à 83 000 $, il s’agissait des seules provinces qui dépassaient le revenu médian national.

Après l’ajustement au coût de la vie dans chaque province, Terre-Neuve et Labrador continuaient de dominer le paysage avec les salaires les plus élevés au pays, même sans tenir compte du bond extraordinaire des revenus l’an dernier. Si l’on utilisait les données de Terre-Neuve et Labrador de l’an dernier et qu’on les ajustait au coût de la vie, la province montrait toujours sur le podium en ce qui concerne les revenus provinciaux.

Les seules autres provinces qui dépassaient le revenu médian national après l’ajustement au coût de la vie étaient le Manitoba.

Figure 1. Cost-of-living adjusted associate veterinarian salaries for 2012. Salaires des vétérinaires associés ajustés au coût de la vie en 2012.


<table>
<thead>
<tr>
<th>Province</th>
<th>Median Salary</th>
<th>Median Salary Adjusted</th>
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</thead>
<tbody>
<tr>
<td>BC</td>
<td>$80,256</td>
<td>$82,193</td>
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<td>AB</td>
<td>$69,662</td>
<td>$72,922</td>
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<tr>
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<td>Canada</td>
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</tbody>
</table>
veterinarians, go to the CVMA Economic Hub and download the report for your province. If you have any questions regarding the Associate Report on Compensation and Benefits please contact Darren Osborne at dosborne@ovma.org or 1-800-670-1702, ext. 14.

et le Nouveau-Brunswick (figure 1). Les deux provinces affichaient des salaires près de 1000 $ supérieurs à la médiane nationale.

Les provinces «nantes», l’Ontario et l’Alberta, accusaient un retard par rapport à toutes les autres provinces pour les salaires ajustés au coût de la vie. Imitant les résultats des années précédentes, les salaires des vétérinaires de l’Alberta n’ont pas réussi à gagner du terrain par rapport au coût de la vie le plus élevé au pays. Les propriétaires de pratique ont effectué des tentatives vaillantes pour suivre le rythme de l’inflation en offrant la hausse annuelle la plus élevée à l’extérieur de Terre-Neuve et Labrador et ils affichaient des salaires se situant au troisième rang avant l’ajustement au coût de la vie. Cependant, cela n’a pas suffi pour compenser les différences du coût de la vie. L’Ontario a aussi affiché des hausses supérieures à la moyenne, mais le salaire était déjà inférieur à la moyenne et les salaires des vétérinaires se sont classés à l’avant-dernière place après l’ajustement au coût de la vie.

Pour obtenir un rapport complet sur les salaires des vétérinaires de même que des données complètes sur les avantages sociaux et les vacances, aller au Carrefour financier de l’ACMV et téléchargez le rapport de votre province. Si vous avez des questions concernant le Rapport sur la rémunération et les avantages sociaux des salariés, veuillez communiquer avec Darren Osborne au dosborne@ovma.org ou au 1-800-670-1702, poste 14.

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