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Dear Editor,

I provide the following perspective on the Editorial titled “Antimicrobial use in animals” in the June 2016 issue of The Canadian Veterinary Journal (Can Vet J 2016;57:573–575). The editorial discusses that, in Canada in 2013, of the kg of medically important antimicrobials used in humans, animals and crops, 78% was used in food-producing animals and, of the antimicrobials in veterinary use less than 1% was used for companion animals.

The Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS) provides detailed information on antimicrobial use (AMU) in Canadian animals (1). It reveals tetracyclines (57%), beta-lactams and penicillins (12%) and other antimicrobials (12%) make up the bulk of medically important antimicrobials used in food animals. In contrast, cephalosporins (41%), beta-lactams and penicillins (35%) and trimethoprim sulfonamides (12%) are the most used antimicrobials in companion animals.

Cephalosporins and fluoroquinolones are classes of antimicrobials of greatest importance to human medicine, and more of these antimicrobials are used in companion animals than food animals. In 2012, cephalosporin use in companion animals was 3948 kg compared to 2440 kg in food-producing animals, and the respective amounts for fluoroquinolones are 215 kg and 191 kg. In 2014, total kg of cephalosporin use in companion animals (191) was less than that used in food-producing animals (2523 kg), yet after correcting for the biomass of the underlying animal populations, companion animal cephalosporin use was four-fold that of food-producing animals (2523 kg), yet after correcting for the biomass of the underlying animal populations, companion animal cephalosporin use was four-fold that of food-producing animals (data on quantities and biomass provided via personal communication CIPARS). Similarly, in 2014, kg of fluoroquinolone use was greater in food-producing animals than companion animals, yet, companion animal use was 25 times greater than food-producing animals use after correcting for biomass. These higher rates of use of antimicrobials of greatest importance to human health, coupled with the intimate contact between humans and their pets suggests the almost exclusive focus on AMU in food animals could be misplaced and due consideration should be given to the risks association with AMU in companion animals.

The editorial discusses a small percentage of pig herds and chicken flocks reported not using antimicrobials and consumer demand might contribute to reduced AMU on farms. Yet provision of veterinary treatment, including antimicrobials when warranted, is typically a cornerstone of prevention of animal cruelty legislation. The UK government’s recent Review on Antimicrobial Resistance points out consumer demands might provide incentives to withhold antimicrobial treatment when otherwise indicated, and suggests a “responsible use of antimicrobials” label as opposed to “antibiotic free” (2). Veterinary colleagues have divulged to me situations in which antimicrobial treatments were withheld from food-producing animals to meet marketing claims. In the discussion of AMU, it is important that veterinarians, producers, and society not lose sight of the role antimicrobials play in animal welfare.

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A recent announcement by Health Canada (1) that it will begin a consultation process regarding irradiation of beef should be of interest to all concerned with food safety. This action is being taken because of recommendations arising from investigations of the 2008 *Listeria monocytogenes* outbreak involving Maple Leaf Foods and the 2012 *E. coli* O157:H7 outbreak involving XL Foods in Brooks, Alberta, as well as a 2013 request by the Canadian Cattlemen’s Association (2). Canada’s Department of Health has reviewed the scientific information on irradiation of foods and “concluded that the irradiation of ground beef within the parameters requested is safe, effective, and does not significantly impact the nutritional quality of the beef any more than cooking would.” (2). Health Canada proposes to amend the Food and Drug Regulations to allow the irradiation of ground beef as an additional safety measure. Any irradiated ground beef would be clearly labelled as irradiated.

Several individuals and groups have come out with statements in support of and in opposition to permitting irradiation of ground beef. Groups that support this measure to enhance food safety include The World Health Organization, the US Food and Drug Administration, The US Department of Agriculture, the Canadian Cattlemen’s Association, and the Canadian Meat Council. Groups opposed to meat irradiation include the US Center for Food Safety, the Organic Consumer Association, and the American Grass-Fed Beef organization. Except for the American Grass-Fed Beef organization, producers and processors in the cattle industry strongly support this proposal. They argue that irradiation of ground beef could save lives and reduce costs to the industry. The 2008 Canadian *L. monocytogenes* outbreak resulted in 22 deaths, temporary closing of a meat processing plant in Toronto, and the recall of 220 items produced at the plant. The 2012 Canadian *E. coli* O157:H7 outbreak caused confirmed illness in 18 persons, the temporary closing of a meat processing plant, and the recall of over 1.8 million kg of beef.

Opponents are individuals and organizations that are concerned about a potentially negative impact on human health. Santé Canada (1) a récemment annoncé le début prochain d’un processus de consultation concernant l’irradiation du bœuf, ce qui devrait intéresser toutes les personnes se préoccupant de la salubrité des aliments. Cette mesure a été prise en raison des recommandations présentées à la suite de l’enquête sur l’éclosion de *Listeria monocytogenes* en 2008 chez les Aliments Maple Leaf, de celle sur l’éclosion d’*E. coli* O157:H7 en 2012 impliquant XL Foods à Brooks, en Alberta, ainsi que d’une demande présentée en 2013 par la Canadian Cattlemen’s Association (2). Santé Canada a examiné les renseignements scientifiques sur l’irradiation des aliments et «a conclu que l’irradiation du bœuf haché réalisé dans les limites des conditions énoncées était sécuritaire, efficace et qu’elle n’avait pas plus d’incidence importante sur la qualité nutritionnelle du bœuf que la cuisson». (2). Santé Canada propose de modifier le Règlement sur les aliments et drogues afin d’autoriser l’irradiation du bœuf haché comme mesure de sécurité additionnelle. Le bœuf haché irradié serait clairement étiqueté comme ayant été irradié.

Several individuals and groups have come out with statements in support of and in opposition to permitting irradiation of ground beef. Groups that support this measure to enhance food safety include The World Health Organization, the US Food and Drug Administration, The US Department of Agriculture, the Canadian Cattlemen’s Association, and the Canadian Meat Council. Groups opposed to meat irradiation include the US Center for Food Safety, the Organic Consumer Association, and the American Grass-Fed Beef organization. Except for the American Grass-Fed Beef organization, producers and processors in the cattle industry strongly support this proposal. They argue that irradiation of ground beef could save lives and reduce costs to the industry. The 2008 Canadian *L. monocytogenes* outbreak resulted in 22 deaths, temporary closing of a meat processing plant in Toronto, and the recall of 220 items produced at the plant. The 2012 Canadian *E. coli* O157:H7 outbreak caused confirmed illness in 18 persons, the temporary closing of a meat processing plant, and the recall of over 1.8 million kg of beef.

Opponents are individuals and organizations that are concerned about a potentially negative impact on human health.
Those who are opposed to irradiation of beef dispute the argument that the product is safe and claim that carcinogenic products such as benzene are produced as a result of the irradiation. Furthermore, irradiation is said to be a poor way of covering up unsatisfactory meat processing practices embedded in a system in which too rapid procedures in the hands of unskilled laborers and inadequate oversight result in meat that is contaminated with feces. Dr. Patricia Whisnant, a veterinarian associated with the grass-fed beef organization said, “Our efforts in the meat industry should be aimed at removing the filth from the source not just making cow manure safer to eat!” (3). Dr. Whisnant believes that “cattle MUST be processed individually by a skilled butcher to avoid cross-contamination and deadly processing mistakes.” Concerns have also been expressed about destruction of vitamins during the treatment. Others claim that irradiation causes objectionable odors, flavors, color, and texture. Yet others fear the emergence of radiation-resistant bacteria, risks to workers, and potential accidents.

The arguments advanced by proponents of irradiation of beef are that this treatment will kill most bacterial pathogens. In particular, the treatment would kill *E. coli* O157:H7 and similar *E. coli* that cause devastating illnesses and deaths in foodborne outbreaks as well as *Listeria monocytogenes*, *Salmonella*, and *Campylobacter jejuni*. The shelf life of irradiated beef would also be extended as spoilage bacteria are also destroyed. The treated beef is considered to be safe — based on expert reviews of considerable data going back over 30 years. The amounts of potential toxic substances that are produced and the loss of vitamins are said to be similar to those produced in making toast and in preparing foods by processes such as cooking. Canada has for a long time approved irradiation of spices, potatoes, onions, and wheat flour. The United States approved irradiation of ground beef almost 20 years ago, pork over 30 years ago, and poultry 26 years ago, but the European Union has not approved this procedure.

So, where should veterinarians stand on this matter? We should weigh the evidence and arrive at logical conclusions. Irradiation of ground beef is likely to drastically reduce outbreaks of beef-related foodborne illnesses and deaths, and will be particularly valuable to individuals with weak or compromised immune systems. It is noteworthy that among the 22 deaths in the Maple Leaf Foods *L. monocytogenes* outbreak, most were in hospitals or long-term care facilities. Expert analysis of considerable data has concluded that irradiated foods are safe. However, government oversight agencies, such as the Canadian Food Inspection Agency, need to continue to ensure that beef is produced in a hygienic manner and that Hazard Analysis Critical Control Points programs in processing plants are carried out appropriately.

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la peine de signaler que, parmi les 22 mortalités causées par l’éclosion de *L. monocytogenes* des Aliments Maple Leaf, la plupart ont eu lieu dans des hôpitaux ou des établissements de longue durée. Les experts ont analysé un nombre considérable de données et ils ont tiré la conclusion que les aliments irradiés sont sûrs. Cependant, les agences de surveillance du gouvernement, comme l’Agence canadienne d’inspection des aliments, doivent continuer d’assurer que le bœuf est produit d’une manière hygiénique et que les programmes d’analyse des risques aux points critiques (HACCP) des usines de transformation sont exécutés de manière appropriée.

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Ethical question of the month — October 2016

A couple living on a small rural property in a non-agricultural area purchase 2 Holstein bull calves at auction to teach their children basic principles of animal husbandry and food production. Two weeks after the calves arrive, the neighbor’s dog gets into the pen and attacks one of the calves. The owners hear the commotion and chase the dog away. One calf is bleeding badly around the face, an ear is torn, there are a couple of puncture wounds on a hind leg, and the calf is trembling constantly. The owners are very upset, as are their children. They call one veterinary clinic after another only to be told on each call that the veterinarian does not do food animal work. When the owners locate a food animal veterinarian 100 km away, they are told that that veterinarian is not accepting new clients. Are such responses in accordance with a veterinarian’s oath to prevent animal suffering?

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, 6486 E. Garafraxa, Townline, Belwood, Ontario N0B 1J0; telephone: (519) 846-3413; fax: (519) 846-8178; e-mail: tim.e.blackwell@gmail.com

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.

Les réponses au cas présenté sont les bienvenues. Veuillez limiter votre réponse à environ 50 mots et nous la faire parvenir par la poste avec vos nom et adresse à l’adresse suivante : Choix déontologiques, a/s du Dr Tim Blackwell, 6486, E. Garafraxa, Townline, Belwood (Ontario) N0B 1J0; téléphone : (519) 846-3413; télécopieur : (519) 846-8178; courriel : tim.e.blackwell@gmail.com

Les propositions de questions déontologiques sont toujours bienvenues! Toutes les questions et situations présentées dans cette chronique s’inspirent d’événements réels dont nous modifions certains éléments, comme les noms, les endroits ou les espèces, pour protéger l’anonymat des personnes en cause.

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Ethical question of the month — July 2016

A nearby successful veterinary practice provides state-of-the-art veterinary medicine and surgery to a large and dedicated clientele. This clinic also offers alternative therapies for conditions that do not respond to conventional treatments. In the past, these therapies were primarily vitamin and herbal products. Owners signed a consent form recognizing that the treatments were unconventional. There is no evidence that these therapies are effective but the clinic has not charged exorbitantly for these services and some of your best clients have gone to this clinic when you have had nothing left to offer but palliative care.

A board-certified surgeon at this clinic who performs complex orthopedic surgeries has recently begun to surgically implant special magnets and other “positive energy” devices in patients in which conventional therapies were ineffective. The implants are accompanied by vague claims that they “could help.” The practice charges several thousand dollars for these surgeries, but this deters fewer clients than you would have predicted. You believe this clinician is using the trust created through the success of his conventional treatments to convince clients to try expensive and unproven “alternative” therapies when in desperate straits. You tolerated the selling of false hope when it was low cost and non-invasive, but this new high cost and invasive approach troubles you. Are you justified in your change in attitude towards the unconventional treatments offered by this practice?

Question de déontologie du mois — Juillet 2016

Une pratique vétérinaire prospère avoisinante offre de la médecine et des chirurgies à la fine pointe technologique à une clientèle vaste et dévouée. Cette clinique offre aussi des thérapies parallèles pour des affections qui ne répondent pas à des traitements conventionnels. Par le passé, ces thérapies étaient principalement des vitamines et des produits à base de plantes. Les propriétaires signaient un formulaire de consentement pour reconnaître que les traitements n’étaient pas conventionnels. Il n’y avait aucune preuve que ces traitements étaient efficaces, mais la clinique ne facturait pas des tarifs exorbitants pour ces services et certains de vos meilleurs clients s’y rendaient lorsque vous n’aviez rien d’autre à leur offrir que des soins palliatifs.

Un chirurgien spécialiste à cette clinique qui effectue les chirurgies orthopédiques complexes a récemment commencé à implanter des aimants spéciaux et d’autres dispositifs à «énergie positive» chez les patients qui ne répondent pas aux traitements conventionnels. Les implants sont accompagnés d’allégations vagues stipulant que les traitements «peuvent aider». La pratique facture plusieurs milliers de dollars pour ces chirurgies et ce fait ne décourage pas autant de clients que vous auriez pu le croire. Vous estimez que ce clinicien utilise une réputation bâtie sur le succès de ses traitements conventionnels pour convaincre les clients de tenter des thérapies «parallèles» dispendieuses et non éprouvées lorsque les clients se trouvent dans des situations désespérées. Vous étiez tolérant de la vente de ces faux-espoirs lorsqu’ils étaient peu dispendieux et non invasifs, mais vous êtes perturbé par cette nouvelle approche coûteuse et invasive. Votre changement d’attitude envers les traitements non conventionnels offerts par cette pratique est-il justifié?

Alternative therapies and unconventional treatments — A comment

As I read the question, I see two practitioners — one that is entrenched in conventional practice and one that is daring to move into the alternative arena.

In this situation, there is a knowledge gap that keeps the conventional veterinarian from understanding what the alternative practitioner does and why he does it. Making the assumption that the veterinarian is offering non-proven therapies at high cost to clients in desperate straits and suggesting it is based on false hope would be considered a derogatory statement for any veterinarian no matter how they practice.

To answer the question, I don’t think the writer can be justified in making any judgement until s/he goes on a fact-finding mission and talks to the surgeon regarding the treatments rather than asking for more opinion from people that are themselves devoid of information on the suspect treatment modalities.

Jeff Grognet, Mid-Isle Veterinary Hospital, 5-161 Fern Road West, Qualicum Beach, British Columbia, Canada
An ethicist’s commentary on alternative therapies and unconventional treatments

In the interest of full disclosure, I need to acknowledge that I am a co-author, with equine veterinarian David Ramey, of a book titled Complementary and Alternative Veterinary Medicine Considered (Wiley-Blackwell, 2004). This book is significantly skeptical of alternative medicine, and neither of us have encountered any reason to mitigate the skepticism we expressed.

One major theme we discuss is that there is in fact no “alternative medicine;” there is medicine that is empirically validated, and medicine that is not empirically validated. Furthermore, in discussing many of the “alternative” modalities that have become commonly used, we actually encountered some that profess to be effective despite their total incompatibility with known science. For example, we discussed homeopathy, which involves diluting a substance many times over until none of its biological properties remain. Thus, for example, homeopathy claims that if one is treating diarrhea, one needs to use laxatives diluted beyond any biological activity. The theoretical claim, which I confess I do not understand, is that the water retains “memory” of what it once was, and thereby cures diarrhea. In any case, if homeopathy is true, modern chemistry must be false!

We as a society are currently very much intoxicated with what is alleged to be “the wisdom of the East,” be it acupuncture or lining up furniture to be in accord with “critical meridians,” an approach known as Feng Shui. We are also enamored of “magic thinking.” More books are sold dealing with “cryptozoology” — than all of biology combined. This is all very well, and we doubtless have a great deal to learn from traditions we have historically neglected. But an open approach to such traditions does not entail jettisoning our critical faculties, scientific knowledge, logic, and common sense.

I think the clinic did the right thing in its historical approach to alternative modalities. If the public demands them, and they cause no harm, and there’s no great profit involved, the entire business is relatively benign. But at the point where the surgeon begins charging thousands of dollars for evidentially baseless “therapies,” a significant line has been crossed. To put it baldly, to charge clients that kind of money begins to smack of scamming needy and gullible people, and can well erode the clinic’s reputation, and indeed the credibility of veterinary medicine. People need to feel confident that when they seek veterinary advice, they are getting information that represents the best knowledge we have, validated in the best way we know. (This is not to say scientific medicine is always correct or even always coherent; for most of the twentieth century it denied the reality of thoughts and feelings in animals.)

I applaud the change in attitude that the clinic owners are evidencing. One’s honor and integrity should not be sold for a mess of potage, or even for a pot of gold. I would straightforwardly approach the clinic owners and tell them that the surgeon is doing is incompatible with the fundamental values underlying good practice, explaining what we argued earlier. I would further advise them that if he wishes to continue selling false hope, he should not do it under their aegis. If he wishes to remain in their practice, he needs to continue to do what he’s trained for. Probably overstepping some line decreed by political correctness, I would inform them that DVM stands for “doctor of veterinary medicine,” not “doctor of voodoo medicine.”

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1. A 6-month-old collie presented with severe pruritus. Skin scrapings reveal mites with 2 anterior pairs of short legs that bear long unjointed stalks with suckers. Which of the following is the most appropriate therapy?
A. Ivermectin orally or subcutaneously
B. Pyrethrin shampoo
C. Selamectin topically
D. Lufenuron orally
E. Chlorhexidine topically

2. Which of the following statements is most correct concerning masticatory muscle myositis?
A. Masticatory muscle myositis is most frequently seen in West Highland white terriers and Scottish terriers but occasionally is seen in other breeds.
B. The signalment and presenting signs for a dog with masticatory muscle myositis is an immature dog with intermittent fever, pain associated with attempting to eat, and pain when opening the mouth.
C. Animals with masticatory muscle myositis present with excessive bone proliferation on the ventral aspect of the mandible and base of the skull resulting in an inability to open the mouth.
D. Masticatory muscle myositis is an immune-mediated disease affecting German shepherd dogs and other adult large-breed dogs; it is treated with immunosuppressive doses of steroids.

3. Which of the following is the test of choice for the diagnosis of hypoadrenocorticism?
A. Adrenocorticotropic hormone (ACTH) response test
B. Low-dose dexamethasone suppression test
C. High-dose dexamethasone suppression test
D. Urinary cortisol-to-creatinine ratio (UCCR)
E. Measurement of endogenous ACTH

1. Un Colley âgé de 6 mois présente du prurit sévère. Les raclages de la peau révèlent des acariens pourvus de deux paires de membres antérieurs qui possèdent de longues tiges non reliées portant des sucsors. Lequel des traitements suivants est le plus approprié?
A. ivermectine par voie orale ou sous-cutanée;
B. shampooing de pyréthrine;
C. selamectine topique;
D. lufenéron par voie orale;
E. chlorhexidine topique.

2. Lequel des énoncés suivants est le plus exact à propos de la myosite des muscles masticateurs?
A. La myosite des muscles masticateurs est la plus fréquemment observée chez le West Highland white terrier et le Scottish terrier, mais, parfois, elle est observée chez d’autres races.
B. Le signalement et les signes cliniques chez un chien souffrant de myosite des muscles masticateurs sont un chien immature présentant de la fièvre intermittente, de la douleur associée à l’ingestion de nourriture et de la douleur lorsqu’il ouvre la gueule.
C. Les patients souffrant de myosite des muscles masticateurs présentent une prolifération osseuse excessive à l’aspect ventral de la mandibule et à la base du crâne résultant en une incapacité à ouvrir la gueule.
D. La myosite des muscles masticateurs est une maladie à médiation immunitaire affectant le Berger allemand et d’autres races de chiens adultes de grande taille; elle est traitée avec des doses immunosuppressives de stéroïdes.

3. Laquelle des épreuves suivantes est le test de choix pour le diagnostic de l’hypoadrénocorticisme?
A. test de réactivité de l’hormone adrénocorticotrope (ACTH);
B. test de freinage à la dexaméthasone à faible dose;
C. test de freinage à la dexaméthasone à forte dose;
D. rapport urinaire cortisol-créatinine;
E. dosage de l’ACTH endogène.
4. Which of the following is the most likely diagnosis for a horse with clinical signs that include poor appetite, flank watching, distended abdomen, tachycardia, and pale mucous membranes?
   A. Colic
   B. Equine gastric ulcer syndrome
   C. Peritonitis
   D. Malabsorption syndrome

5. A group of adult bred sows are experiencing an increased incidence of early embryonic death, along with prolonged anestrous intervals. Prepubertal females on the same diet are experiencing signs associated with hyperestrogenism. Some immature boars, receiving the same diet, are experiencing reduced libido and impaired testicular development. Which of the following is a likely cause of all these conditions?
   A. Aflatoxin
   B. Zearalenone
   C. Fumonisin
   D. Deoxynivalenol
   E. Ergot

(See p. 1094 for answers.)
2016 CVMA Convention and Council Meeting

The Canadian Veterinary Medical Association (CVMA) held its 68th Convention, for the first time in Niagara Falls, Ontario, from July 7 to 10, with the slogan, “Exciting! Inspiring! Motivating!” This Annual Convention is Canada’s biggest national veterinary multi-species event. Approximately 1000 participants attended over 100 sessions delivered by a total of 37 speakers — an unprecedented diversity of offerings. The continuing education was RACE (Registry of Approved Continuing Education) approved by the American Association of Veterinary State Boards, of which most Canadian veterinary regulatory bodies are members. The CVMA’s Annual

Conseil de l’ACMV, rangée avant, de gauche à droite : Drs Margaret Brown-Bury (Terre-Neuve), Tom Meyers (AVMA President-Elect), Nicole Gallant (CVMA 2015–2016 President), Joseph Kinanney (AVMA President), and Ms. Elizabeth Hartnett (in-coming SCVMA President). Second row, left to right: Mr. Justin Kristjansson (SCVMA President), Drs. Timothy Arthur (Ontario), Michele Guerin (OVC/WCVM/UCVM), Terri Chotowetz (Executive Member), and Jean Gauvin (Past-President). Third row, left to right: Drs. Kevin Millar (Manitoba), Troye McPherson (Vice-President), Enid Stiles (Quebec), and Walter Ingwersen (WSAVA President-Elect). Fourth row, left to right: Drs. Kathleen MacMillan (AVC/FMV), Barry Stemshorn (Treasurer), Ms Lois Ridgway, RVT (RTVTC), Drs. Melanie Hicks (New Brunswick), and Juanita Glenross-Winslow (Prince Edward Island). Back row, left to right: Dr. Troy Bourque (President-Elect), and Mr. Jost am Rhyn, (CEO). Absent: Dr. Rob Ashburner (British Columbia).

Convention enjoys the valued collaboration of the Registered Veterinary Technologists and Technicians of Canada (RVTTC).

CVMA Convention – where Canada’s veterinarians meet

Approximately 200 individuals participated in this year’s Annual General Meeting (AGM), which provided members with an update on the CVMA’s activities. Canada’s Minister of Health, the Honorable Jane Philpott, addressed a letter to the AGM in which she stated: “Your commitment to excellence in veterinary medicine helps not only to ensure the health and well-being of both companion and livestock animals in Canada but also contributes to public health and the safety of the food supply.”

“The complications of antimicrobial resistance (AMR) are quickly becoming a global health concern. The Government of Canada is taking concrete action to address the inappropriate use of antimicrobial drugs and to develop long-term solutions to combat bacterial infections.” “I would like to acknowledge the Canadian Veterinary Medical Association’s work on developing a pan-Canadian Framework of professional practices that will complement Health Canada’s efforts to mitigate the risks of AMR.”

The new CVMA president and Executive were introduced as follows: Dr. Troy Bourque, president; Dr. Troye McPherson, president-elect; Dr. Terri Chotowetz, vice-president; Dr. Melanie Hicks, executive member; Dr. Nicole Gallant, immediate past-president; with Dr. Barry Stemshorn, staying on as treasurer; and Mr. Jost am Rhyn, as chief executive officer. The CVMA extends its sincere thanks to the parting immediate past-president, Dr. Jean Gauvin, for his leadership, energy and enthusiasm throughout his 8-year tenure on Council.

La Dr. Nicole Gallant (à droite), la présidente sortante de l’ACMV, remet l’épinglette du président au Dr. Troy Bourque, président de l’ACMV (2016–2017).

Le nouveau président de l’ACMV et l’exécutif ont été présentés comme suit : le Dr Troy Bourque, président; la Dr Troye McPherson, présidente désignée; la Dr Terri Chotowetz, vice-présidente; la Dr Melanie Hicks, membre de l’exécutif; la Dr Nicole Gallant, présidente sortante; et le Dr Barry Stemshorn, qui continuera d’occuper son poste de trésorier; et M. Jost am Rhyn, à titre de président-directeur général. L’ACMV félicite sincèrement le président sortant qui quitte ses fonctions, le Dr Jean Gauvin, pour son leadership, énergie et enthousiasme pendant son mandat de huit ans au sein du Conseil.

Durant le déjeuner de remise des prix, l’ACMV a célébré les réalisations et les contributions exceptionnelles des récipiendaires de prix talentueux et dévoués :

- Animal Care Centre of Strathmore : Prix de la pratique de l’année de l’ACMV
- Dr Shawn Llewellyn : Prix humanitaire de l’ACMV
- Dr Larry Hammell : Prix vétérinaire Merck
- Dr Ernie Prowse : Prix du praticien des petits animaux de l’ACMV
- Dr Melodie Chan : Prix de l’industrie de l’ACMV
- M. Justin Kristjansson : Prix R.V.L. Walker
- Dr Bernhard Pukay : Titre de membre à vie de l’ACMV
- Dr Sylvie Latour : Prix du président de l’ACMV

Plus de 190 personnes étaient inscrites au Sommet 2016 de l’ACMV, qui a été présidé par le Dr Troy Bourque. Le Sommet de cette année a porté sur les modifications proposées à la réglementation fédérale en vue de la surveillance vétérinaire sur l’utilisation des antimicrobiens, qui doit entrer en vigueur d’ici la fin de 2017. En collaboration avec le Conseil canadien des registaires vétérinaires (CCRV), l’ACMV a élaboré un cadre de travail pancanadien de la surveillance vétérinaire des antimicrobiens à la lumière de la nouvelle réglementation. Ce cadre de travail et ces recommandations feront l’objet d’un atelier interactif auquel...
During the Awards-Luncheon, the CVMA celebrated the achievements and outstanding contributions of the following talented and dedicated award recipients:

- **Animal Care Centre of Strathmore**: CVMA Practice of the Year Award
- **Dr. Shawn Llewellyn**: CVMA Humane Award
- **Dr. Larry Hammell**: Merck Veterinary Award
- **Dr. Ernie Prowse**: CVMA Small Animal Practitioner Award
- **Dr. Melodie Chan**: CVMA Industry Award
- **Mr. Justin Kristjansson**: R.V.L. Walker Award
- **Dr. Bernhard Pukay**: CVMA Life Membership
- **Dr. Sylvie Latour**: CVMA President’s Award

Over 190 individuals registered for the 2016 CVMA Summit, chaired by Dr. Troy Bourque. This year’s Summit focused on the newly proposed federal regulatory changes for more veterinary oversight on the use of antimicrobials, scheduled to come into effect before the end of 2017. In collaboration with the Canadian Council of Veterinary Registrars (CCVR), the CVMA developed a pan-Canadian Framework on veterinary oversight of antimicrobial use in light of the new regulations. This Framework and its recommendations were the topic of an interactive session involving veterinarians, producers and regulators, among others.

In addition to the presidents and registrars of the veterinary regulatory bodies, several high-ranking federal government officials representing various departments were in attendance, including Dr. Theresa Tam, Deputy Chief Health Officer/Assistant Deputy Minister, Infectious Disease Prevention and Control with the Public Health Agency of Canada (PHAC); Dr. Martine Dubuc, Chief Food Safety Officer for Canada; and Dr. Harpreet Kochhar, Chief Veterinary Officer for Canada, both with the Canadian Food Inspection Agency (CFIA); and Dr. Manisha Mehrotra, director, Human Safety Division, Veterinary Drugs Directorate, Health Canada.

Since the inception of the CVMA Emerging Leaders Program in 2009, 183 individuals have participated in this unique experience. Thirty-four participants engaged in this year’s program, participate notably the veterinarians, the productuers and the organes de réglementation.

En plus des présidents et des registraires des organismes de réglementation de la médecine vétérinaire, plusieurs hauts fonctionnaires du gouvernement fédéral représentant les divers ministères étaient présents : la D* Teresa Tam, sous-administratrice en chef de la santé publique et sous-ministre adjointe de la Direction générale de la prévention et du contrôle des maladies infectieuses de l’Agence de la santé publique du Canada (APSC); la D* Martine Dubuc, chef de la salubrité des aliments du Canada; et le D* Harpreet Kochhar, vétérinaire en chef du Canada, tous deux de l’Agence canadienne d’inspection des aliments (ACIA); et la D* Manisha Mehrotra, directrice, Division de l’innocuité pour les humains, Direction des médicaments vétérinaires, Santé Canada.

Depuis la création du Programme des futurs leaders de l’ACMV en 2009, 183 personnes ont participé à cette expérience unique. Trente-quatre participants étaient présents au programme de cette année, qui était commandité par VIROX Animal Health. Le programme est conçu afin d’identifier les futurs leaders de la profession et de leur transmettre des compétences liées au travail d’équipe, à la communication et au professionnalisme.

Le nouveau Forum sur les enjeux nationaux de l’ACMV a porté sur l’ébauche de l’énoncé de position sur l’enjeu de l’importation des chiens au Canada. Le forum a permis de se pencher sur les facteurs de santé animale et de santé publique qui suscitent des préoccupations de la part de la profession vétérinaire au Canada à l’égard de l’importation.

Les vétérinaires et les intervenants se sont réunis et plusieurs réunions ont eu lieu : les présidents des organismes de réglementation et des associations d’intérêts professionnels, les groupes d’espèces nationales et de spécialistes, le forum provincial, une réunion des doyens et la réunion du CCRV. Vétérinaires sans frontières a profité de la soirée sociale pour tenir un encan silencieux afin de recueillir des fonds. Au cours des dernières années, TTVAC a tenu son AGA et une réunion du Conseil durant le congrès de l’ACMV.
which was sponsored by VIROX Animal Health. The program is designed to identify future leaders in the profession and provide them specifically with skills relating to team work, communications and professionalism.

The new CVMA National Issues Forum focused on the draft position statement on the issue of dog importation into Canada. The forum allowed for discussions on the social, animal and public health factors that make importation a concern for the veterinary profession in Canada.

Veterinarians and stakeholders met during alumni events, and meetings of presidents of regulatory and self-interest associations, national species and specialty groups, the Provincial Forum, a meeting of deans, and the CCVR meeting. The Veterinarians without Borders took advantage of the social evening to hold a silent auction to raise funds. As in past years, the RVTTC held its AGM and a Board meeting in conjunction with the CVMA Convention.

**From the Council Table**

**Vision Statement:** Council adopted the following vision statement, describing the preferred future of the CVMA:

“The CVMA is the voice of the Canadian veterinary profession in promoting animal welfare and One Health, to ensure optimal care for animals, people and the environment.”

**Principles of Veterinary Medical Ethics of the CVMA:** Since 1955, the CVMA has had a “Code of Ethics” as part of its Constitution and Bylaws. In collaboration with Dr. Barb Horney, Dr. Troy Bourque initiated the updating of this Code and drafted the new Principles of Veterinary Medical Ethics of the CVMA. With a few last amendments, Council approved the principles. The document can be found on CVMA's website.

**“Veterinary Oversight of Antimicrobial Use — A Pan-Canadian Framework for Professional Standards for Veterinarians”:** This document, developed by the CVMA in collaboration with the CCVR, serves as a template for provincial and territorial veterinary regulatory bodies when developing their own regulations adapted to the new federal regulations, scheduled to be in place prior to the end of 2017. After having received and incorporated feedback from a broad range of stakeholders, including but not limited to veterinarians, producers and regulators, the Framework was discussed in July 2016 at the CVMA Summit. The feedback received will be considered in the next version of the Framework.

The scheduled federal regulatory and policy changes will include, but will not be limited to strengthened veterinary oversight of all medically-important antimicrobials (MIAs) by moving all MIAs used in food animal production to the existing Prescription Drug List; the prohibition of the importation of unapproved drugs for own-use in animals that may be consumed as food (some exemptions may apply); phasing out non-prudent uses of MIAs in animals for long-term non-therapeutic purposes, i.e. growth promotion and weight gain; and the restriction of importation of active pharmaceutical ingredients to establishments licensed by the government.

The CVMA continues its monthly antimicrobial resistance (AMR) awareness campaign to help prepare veterinarians for the regulatory changes to come.

**De la table du Conseil**

**Énoncé de vision** : Le Conseil a adopté l’énoncé de vision suivant afin de décrire l’avenir envisagé pour l’ACMV :

« L’ACMV est la voix de la profession vétérinaire canadienne pour la promotion du bien-être animal et d’Une santé, afin d’assurer des soins optimaux pour les animaux, les personnes et l’environnement. »

**Principes de déontologie médicale vétérinaire de l’ACMV :** Depuis 1955, l’ACMV possède un « Code déontologique » dans sa constitution et son Règlement administratif. En collaboration avec la Dr Barb Horney, le Dr Troy Bourque a entamé la mise à jour de ce Code et a rédigé les nouveaux Principes de déontologie médicale vétérinaire de l’ACMV. Le Conseil a approuvé les principes en apportant quelques dernières modifications. Le document est disponible sur le site Web de l’ACMV.

**Surveillance vétérinaire de l’utilisation des antimicrobiens** — Un cadre de travail pan-canadien pour les normes professionnelles régissant les médecins vétérinaires »: Ce document, qui a été préparé par l’ACVM en collaboration avec le CCVR, sert de modèle pour les organismes de réglementation provinciaux et territoriaux de la médecine vétérinaire lors de l’élaboration de leurs propres réglements adaptés à la nouvelle réglementation fédérale, qui doit être mise en place d’ici la fin de 2017. Après avoir reçu et intégré de la rétroaction provenant d’un vaste éventail d’intervenants, y compris des vétérinaires, des producteurs et des organismes de réglementation, le Cadre de travail a fait l’objet de discussions en juillet 2016 lors du Sommet de l’ACVM. La rétroaction reçue sera considérée dans la prochaine version du Cadre de travail.

Les modifications prévues à la réglementation et aux politiques fédérales incluront, entre autres, une surveillance vétérinaire accrue de tous les antimicrobiens importants sur le plan médical en les plaçant tous sur la Liste des drogues d’ordonnance; en interdisant l’importation de médicaments non homologués pour usage personnel chez les animaux qui peuvent être consommés sous forme d’aliments (certaines exemptions pourront s’appliquer); en éliminant progressivement les antimicrobiens importants sur le plan médical chez les animaux à des fins thérapeutiques à long terme, c.-à-d., la promotion de la croissance et le gain de poids; et en limitant l’importation des ingrédients pharmaceutiques actifs titulaires d’un brevet gouvernemental.

L’ACVM poursuit sa campagne mensuelle de sensibilisation à l’antibiorésistance afin d’aider à préparer les vétérinaires aux modifications réglementaires à venir.

**Lignes directrices sur l’administration judicieuse des antimicrobiens :** L’ACVM travaille à un plan de travail et elle cherche à obtenir une subvention fédérale afin de mettre à jour les Lignes directrices de l’ACVM 2008 sur l’administration judicieuse des antimicrobiens pour les bovins laitiers, les bovins de boucherie, la volaille et les porcs. Le projet inclura une évaluation des besoins visant les utilisateurs futurs des lignes directrices et la création de nouveaux outils pour l’utilisation prudente des antimicrobiens chez les petits animaux. L’échéancier provisoire pour l’achèvement de ce projet est fin mars 2018.

**Surveillance de l’utilisation des antimicrobiens :** Au nom de ses membres, l’ACVM continue de participer à l’initiative fédérale pour la mise au point de la surveillance des antimicrobiens. La
Antimicrobial Prudent Use Guidelines: The CVMA is working on a plan and seeking a federal funding contribution to renew the CVMA Antimicrobial Prudent Use Guidelines 2008 for beef cattle, dairy cattle, poultry and swine. This project will include a needs assessment involving the future users of such guidelines and the further development of antimicrobial prudent use tools for small animals. The timeframe for completion of this temporary project is March 2018.

Antimicrobial Use (AMU) Surveillance: On behalf of its members, the CVMA remains involved in the Federal Government initiative to develop AMU surveillance. The lead for this project has recently been moved to the Science Branch of the CFIA.

Animal Welfare Strategic Plan: Council approved the 2016–2019 CVMA Plan for Animal Welfare Advocacy, the outcome of the Strategic Planning Session that took place in March 2016 with CVMA Council and the Animal Welfare Committee. The CVMA’s related goal is “To be a strong, visible, active and leading advocate for animal welfare.” Focal areas will be animal abuse, farmed animal welfare, transportation of animals, stray and feral animals, and medically unnecessary procedures.

Induced Molting of Poultry: Council approved the following revised position:

“The Canadian Veterinary Medical Association (CVMA) is opposed to molt induction by methods involving deprivation of food or water. All methods of induced molting are known to cause some degree of stress to birds. When necessary, veterinary supervised induced molting is only acceptable using methods that minimize bird stress and suffering.”

Castration of Piglets: Council approved the following revised position:

“The Canadian Veterinary Medical Association (CVMA) holds that surgical castration of piglets to prevent boar-taint and aggression in post-pubertal boars is a painful procedure at any age and effective anestheisa and analgesia is required for all ages of pigs. The CVMA encourages development and implementation of practical analgesic and anesthetic protocols for, and alternatives to, swine castration.”

Disbudding and Dehorning of Cattle: Council approved the following revised position:

“The Canadian Veterinary Medical Association (CVMA) supports disbudding/dehorming in cattle for human and animal safety reasons provided that disbudding is performed within the first month of life, appropriate anestheisa and perioperative analgesia are used to control the pain involved and, in the case of dehorning, bleeding is controlled. The CVMA supports selective breeding of polled cattle.”

Use of Thermocautery for the Treatment of Lameness in Horses: Council approved the following revised position:

“The Canadian Veterinary Medical Association (CVMA) is opposed to the painful and ineffective treatment of lameness using thermocautery (“pin firing” or “firing”) in horses as the practice is ineffective and is inconsistent with evidence-based medicine.”

Tail Docking of Dairy Cattle: Council approved the following revised position:

“The Canadian Veterinary Medical Association (CVMA) is opposed to the docking of the tails of dairy cattle. Tail docking does not contribute to the improved health and welfare of the cow.”

personne responsable de ce projet a récemment été mutée à la Direction générale des sciences de l’ACIA.


Mue forcée de la volaille : Le Conseil a approuvé l’énoncé de position révisé suivant :

«L’Association canadienne des médecins vétérinaires (ACMV) s’oppose à l’induction de la mue par des méthodes selon lesquelles les animaux sont privés d’eau et de nourriture. Toutes les méthodes de mue induite causent un certain niveau de stress à la volaille. Au besoin, une mue induite sous surveillance vétérinaire est seulement acceptable en ayant recours à des méthodes acceptables qui minimisent le stress et la souffrance des oiseaux.»

Castration des porcelets : Le Conseil a approuvé l’énoncé de position révisé suivant :

«L’Association canadienne des médecins vétérinaires (ACMV) maintient que la castration des porcelets pour prévenir l’agression et une mauvaise odeur chez les verrats postpubertaires est une intervention douloureuse à l’import de quel âge et qu’une anesthésie et une analgésie efficaces sont requises pour les porcs de tout âge. L’ACMV encourage l’élaboration et la mise en œuvre de protocoles analgésiques et anesthésiques pratiques pour la castration des porcs ainsi que des méthodes de remplacement à cette intervention.»

Enlèvement des bourgeons et écornage du bétail : Le Conseil a approuvé l’énoncé de position suivant :

«L’Association canadienne des médecins vétérinaires (ACMV) appuie l’enlèvement des bourgeons et l’écornage du bétail pour des raisons de sécurité des humains et des animaux pourvu que l’écornage soit réalisé durant les premiers mois de la vie, qu’une anesthésie et une analgésie péri-opératoires appropriées soient utilisées pour contrôler la douleur et que, dans le cas de l’écornage, le saignement soit contrôlé. L’ACMV appuie l’élevage sélectif du bétail sans cornes.»

Utilisation de la thermocautérisation pour le traitement de la boiterie chez les chevaux : Le Conseil a approuvé l’énoncé de position révisé suivant :

«L’Association canadienne des médecins vétérinaires (ACMV) s’oppose au traitement douloureux et inefficace de la boiterie à l’aide de la thermocautérisation (application des pointes de feux) chez les chevaux car la pratique est inefficace et n’est pas conforme à une médecine basée sur des données probantes.»

Amputation de la queue des bovins laitiers : Le Conseil a approuvé l’énoncé de position révisé suivant :

«L’Association canadienne des médecins vétérinaires (ACMV) s’oppose à l’amputation de la queue des bovins laitiers. L’amputation de la queue ne contribue pas à l’amélioration de la santé et du bien-être de la vache.»
Use of Animals in Entertainment: Council gave the directive to draft 3 new separate position statements on 1. Use of Animals in Sport; 2. Use of Animals in Recreation; and 3. Use of Animals in Entertainment. The current position statement will be maintained until Council approves the 3 new statements.

Ownership and Selection of a Pet: The CVMA will develop a dedicated area on its website to provide access to a range of related resources, of value to veterinarians and the public. The CVMA’s current position statement on Ownership and Selection of a Pet will be maintained.

Electroimmobilization: In 2017, the CVMA will replace its current position statement with a new position on “The Use of Pain Technologies to Modify Behavior in Animals”. Bill C-246 “Modernizing Animal Protections Act”: The CVMA met with Member of Parliament P. Nathaniel Erskine-Smith, who introduced this Private Member’s Bill. The House of Commons discussed the Bill during its 2nd reading in May. In September, it will decide whether to send the Bill to Committee. The CVMA sent to all MPs a letter of support in principle for the Bill. The CVMA also reached out to all species veterinary associations, producer groups and provincial veterinary associations, seeking support for the Bill. In June, the CVMA sent a letter to all Canadian veterinarians suggesting that they meet with their MP to discuss the Bill and/or send a letter of support to their MP. The CVMA hopes this Bill will pass a 2nd reading and provide an opportunity for the CVMA to appear before Committee, presumably in the fall of 2016.

Veterinary Technology/Veterinary Technician Program Accreditation: Council approved the accreditation of the Veterinary Technician Program at Northern College at Haileybury, Ontario and an extension of accreditation of the Animal Health Technology Program at Vanier College in Saint-Laurent, Quebec.

Mentoring Program: Thirty-six members have volunteered so far as mentors in the CVMA Mentoring Program. The Western College of Veterinary Medicine (WCVM), in conjunction with the Western Provincial VMAs, has developed a mentor skills development program. The CVMA and WCVM are working together to link these 2 programs by promoting the availability of CVMA program mentors to mentees and providing mentors with insights into the mentee program.

Federal Small Business Tax: The federal government has frozen the small business tax rate at 10.5%, contrary to last year’s promises to reduce the rate by 0.5% per year, down to 9% by 2019. On behalf of its members, the CVMA will keep an eye on the federal government’s plans to “…undertake a review of the tax system to determine whether it works well for Canadians, with a view to eliminating poorly targeted and inefficient tax measures”. The CVMA will do this in collaboration with the Canadian Federation of Independent Business, the Canadian Chamber of Commerce and a number of professional organizations.

Canadian Veterinary Reserve (CVR): The CVR conducted a call-up drill to assess the responsiveness of CVR members to a call-up and test the CVR management and administrative processes and procedures in a call-up exercise. In total, 213 CVR members were called up and 166 (78%) responded. Of the respondents, 103 reservists (62%) were available to serve.


Possession et choix d’un animal de compagnie: L’ACMV élaborera une section spéciale sur son site Web afin de fournir l’accès à diverses ressources qui seront utiles pour les vétérinaires et le public. L’énoncé actuel de l’ACMV sur la possession et le choix d’un animal de compagnie sera conservé.


Projet de loi C-246 «Loi sur la modernisation des mesures de protection des animaux»: L’ACMV a rencontré le député fédéral P. Nathaniel Erskine-Smith, qui a déposé ce projet de loi émanant d’un député. La Chambre des communes a discuté le projet de loi en deuxième lecture en mai. En septembre, elle décidera si le projet de loi sera acheminé à un comité aux fins d’examen. L’ACMV a envoyé une lettre d’appui de principe à ce projet de loi à tous les députés fédéraux. L’ACMV a aussi communiqué avec l’ensemble des associations de spécialistes vétérinaires, des groupes de producteurs et des associations provinciales de médecins vétérinaires, afin de solliciter leur appui pour ce projet de loi. En juin, l’ACMV a acheminé une lettre à tous les vétérinaires canadiens pour leur suggérer de rencontrer leur député fédéral pour discuter du projet de loi et/ou d’envoyer une lettre d’appui à leur député fédéral. L’ACMV espère que ce projet de loi sera adopté en deuxième lecture et qu’il fournira l’occasion à l’ACMV de se présenter devant le comité, probablement à l’automne 2016.

Programme d’agrément des programmes de technologie vétérinaire et de techniques vétérinaires: Le Conseil a approuvé l’agrément du programme de techniques vétérinaires de Northern College à Haileybury, en Ontario, ainsi que le prolongement de l’agrément du Programme de technologie en santé animale du Collège Vanier à Saint-Laurent, au Québec.

Programme de mentorat: Trente-six membres se sont portés bénévoles jusqu’à maintenant à titre de mentors du Programme de mentorat de l’ACMV. Le Western College of Veterinary Medicine (WCVM), de concert avec les AMV provinciales de l’Ouest, a mis au point un programme de perfectionnement des compétences à l’intention des mentoriés. L’ACMV et le WCVM travaillent en collaboration afin de relier ces deux programmes et de faire la promotion de la disponibilité des mentors du programme de l’ACMV auprès des mentoriés en fournissant des mentors d’expérience pour le programme des mentorés.

Impôt fédéral pour les petites entreprises: Le gouvernement fédéral a gelé le taux d’imposition des petites entreprises à 10.5 %, contrairement aux promesses faites l’an dernier pour la réduction du taux d’imposition de 0.5 % par année pour atteindre un taux de 9 % d’ici 2019. Au nom de ses membres, l’ACMV surveillera les projets du gouvernement fédéral qui vise à réaliser un examen du régime fiscal afin de déterminer s’il fonctionne bien pour les Canadiens, en vue d’élimer les mesures fiscales mal ciblées et
Public Relations: The CVMA will continue its year-long social media PR campaign to promote the profession. New Facebook and Twitter messages are posted on the 3rd Wednesday of every month and all veterinary medical associations and veterinarians are asked to do the same.

In partnership with Merck Animal Health, the CVMA declared March 2016 to be the first National Tick Awareness Month and provided veterinarians with an informative webinar and consumer-friendly communication material, including waiting- and exam-room posters and social media posts.

2017 Convention and beyond

In 2017, the CVMA Convention will take place in Charlottetown, Prince Edward Island from July 13 to 16.

In 2018, the CVMA Convention will take place in Vancouver, British Columbia from July 5 to 8.

In 2019, the CVMA will co-host the World Small Animal Association (WSAVA) Congress in Toronto, Ontario from July 8 to 12.

A special thank you to the Professional Development Committee for its work on the 2016 and upcoming CVMA Conventions.

(by Jost am Rhyn, CEO, CVMA)

Animal Health + Human Health + Planet Health = One Health
Happy Animal Health Week!

Santé animale + Santé humaine + Santé de la planète = Une seule santé
Joyeuse Semaine de la vie animale!

This month, we celebrate Animal Health Week from October 2 to 8, 2016. The Canadian Veterinary Medical Association (CVMA) will highlight the importance of a One Health approach to all healthcare through the campaign slogan “Animal Health + Human Health + Planet Health = One Health.” Animal health is intrinsically tied to the health of humans and that of the environment. We are promoting the value of working together to protect the health of animals, people and the planet wholly and globally. We’re reminding animal owners that ensuring the health of their animals not only

Cette mois-ci, nous célébrons la Semaine de la vie animale du 2 au 8 octobre 2016. L’Association canadienne des médecins vétérinaires (ACVM) souligne l’importance de l’approche d’Une seule santé à l’égard de tous les soins de santé sous la bannière du slogan de la campagne «Santé animale + Santé humaine + Santé de la planète = Une seule santé». La santé animale est intrinsèquement liée à la santé des humains et à celle de l’environnement. Nous faisons la promotion de la valeur du travail concerté pour protéger complètement la santé des animaux, des humains et de la planète à l’échelle mondiale. Nous rappelons aux
protects their animals, but secures the health of humans and the environment as well. Every step you take to protect the animals in your care contributes to the global health of the population and the planet.

We’re reminding animal owners that:

• The concept of **ONE HEALTH** involves groups of professionals, including veterinarians, physicians, and scientists, working together to attain optimal health for animals, people, and the environment.

• The health of humans, animals and ecosystems is interconnected. Keeping one healthy requires that all are healthy.

• Everyone can contribute to **ONE HEALTH** for the betterment of health in people, animals and the planet.

• The health of your animal can have an important influence on your health and global health.

• Veterinarians play a critical role in **ONE HEALTH** as they manage the connection between animal health, human health and the state of the environment.

• Responsible animal ownership that includes regular veterinary visits, vaccinations, parasite prevention, exercise and optimal nutrition protects the health of people and our global environment for **ONE HEALTH**.

The CVMA has promoted Animal Health Week for over 30 years. We invite you to share your celebrations on Facebook or tweet using the hashtag **#celebrateAHW**.

Generous support of the 2016 Animal Health Week campaign is provided by Principal Sponsor Petsecure Pet Health Insurance, and Program Sponsors iFinance Petcard, and Merial.

During this week-long campaign many veterinary clinics and hospitals host open houses, plan dog washes, organize pet poetry or photo contests, and clinic tours. Some veterinarians visit school children or appear on television to talk about animal health care.
Top 10 Questions from the 2016 National Tick Awareness Month Webinars in March

Les dix questions les plus fréquemment posées lors des webinaires de l'édition 2016 du Mois national de la sensibilisation aux tiques tenu en mars

The Canadian Veterinary Medical Association, in partnership with Merck Animal Health, produced 2 regionally focused webinars to help launch Canada’s first-ever National Tick Awareness Month in March 2016.

Below you’ll find the “top 10” questions submitted as well as the answers graciously provided by our guest experts.

• Michael W. Dryden, DVM, MS, PhD, Professor of Veterinary Parasitology, Kansas State University
• Robbin Lindsay, PhD, National Microbiology Laboratory, Public Health Agency of Canada
• Scott Stevenson, BMSc, MSc, DVM, Locum, Thousand Islands Veterinary Services

1. How does an area get labeled as “established” with blacklegged ticks or “endemic” for Lyme disease? Who makes this decision?

For an area to be considered to have an established blacklegged tick population, all life stages of this parasite must be found for 2 consecutive years by active surveillance (i.e., going out into the woods and dragging for ticks). In addition, Borrelia burgdorferi must be found both in ticks (nymphs and adults) and circulating in the blood of small mammals (white-footed mice mostly) for an area to be considered endemic for Lyme disease.

The original criteria used to define an area as endemic were developed in 1991 by the federal government, in partnership with provincial public health authorities. Since there were relatively few blacklegged tick populations established in Canada at that time, a high standard was set to ensure that only areas with bona fide tick populations were included. However, this definition was a poor indicator of where ticks were emerging because it required a population to be present for at least 2 years before being considered established.

With the rapid expansion of blacklegged tick populations in Canada, a simpler and more cost-effective means of assessment was developed, based primarily on the outcomes of drag sampling.

Areas where blacklegged ticks can be detected by drag sampling are defined as Lyme disease “risk areas,” and their geographic extent is defined by provincial public health authorities. In most cases, risk areas include the site(s) where ticks are collected, as well as an additional buffer zone (usually 20 to 25 km in radius) around the collection site(s).

Using these new criteria, it has been possible to document the expansion of ticks into new areas more rapidly than in the past.

2. Our veterinary clinic is located in an Ixodes scapularis tick endemic area. Temperatures are fluctuating and have at times reached +4°C. When should we start using tick preventive products?

First, it is important to make pet owners aware that ticks are active when the thermometer reaches 4°C and over, and that they should check themselves and their dogs for ticks daily when temperatures are above the freezing mark.

L’Association canadienne des médecins vétérinaires, en partenariat avec Merck Santé animale, a produit deux webinaires régionaux afin d’appuyer le lancement du premier Mois national de la sensibilisation aux tiques tenu en mars 2016. Vous trouverez ci-dessous les 10 questions les plus fréquemment posées, ainsi que les réponses gracieusement fournies par nos experts invités.

• Michael W. Dryden, D.M.V., M. Sc., Ph. D., professeur de parasitologie vétérinaire, Kansas State University
• Robbin Lindsay, Ph. D., Laboratoire national de microbiologie, Agence de la santé publique du Canada
• Scott Stevenson, B. M. Sc., M. Sc., D.M.V., médecin vétérinaire remplaçant, Thousand Islands Veterinary Services

1. Comment une région devient-elle considérée comme ayant une population «établie» de tiques à pattes noires ou comme étant «endémique» pour la maladie de Lyme? Qui prend cette décision?

Pour qu’une région soit considérée comme ayant une population établie de tiques à pattes noires, tous les stades de vie de ce parasite doivent y avoir été recensés pendant deux années consécutives lors d’activités de surveillance active (c’est-à-dire en traînant un filet dans les bois pour prélever des tiques). Pour qu’une région soit considérée comme étant endémique pour la maladie de Lyme, la bactérie Borrelia burgdorferi doit être isolée à la fois dans les tiques (nymphes et adultes) et dans la circulation sanguine de petits mammifères (souris à pattes blanches principalement).

Les critères utilisés pour définir une région endémique ont été établis en 1991 par le gouvernement fédéral, en partenariat avec les autorités de santé publique provinciales. Comme il y avait relativement peu de populations de tiques à pattes noires établies au Canada à ce moment, une norme stricte a été fixée pour s’assurer que seules les régions ayant bel et bien des populations de tiques établies seraient retenues. Cependant, cette définition était un mauvais indicateur des régions où les tiques étaient émergentes, car elle nécessitait que la population de tiques soit présente depuis au moins deux ans avant d’être jugée comme étant établie.

Avec l’expansion rapide des populations de tiques à pattes noires au Canada, une méthode d’évaluation plus simple et plus économique a été élaborée, fondée principalement sur les résultats d’échantillonnage par filet traînant.

Les régions où des tiques à pattes noires peuvent être détectées par la méthode du filet traînant sont désignées «régions à risque» pour la maladie de Lyme, et leur étendue géographique est déterminée par les autorités de santé publique provinciales. Dans la plupart des cas, les régions à risque comprennent les sites où des tiques ont été recueillies, ainsi qu’une zone tampon (habituellement d’un rayon de 20 à 25 km) entourant ces sites.

Grâce à ces nouveaux critères, il a été possible de documenter l’expansion des tiques dans de nouvelles régions plus rapidement que dans le passé.
When we have days during which temperatures are consistently above 4°C — as was the case, for example, this past December or late March, in most parts of Canada — it makes sense to start (or in the case of this past December, to continue) using preventive products. In Lyme disease risk areas, and in the case of clients who travel to these areas, vaccination should also be considered.

Ideally, when controlling ticks and reducing the risk of disease transmission, a 3-pronged approach is recommended, in this order:
1) Vigilance/daily tick checks.
2) Preventive products, if the weather is appropriate for tick activity.
3) Vaccination, if there is a significant risk of exposure (i.e., a pet living in an established Lyme disease area, or travelling to or through a risk area).

Given that winter temperatures can fluctuate widely and that it is not uncommon for them to rise above freezing, and even above 4°C, recommending year-round tick control is a logical conclusion in many locations in North America.

2. Notre clinique vétérinaire est située dans une région où la tique *Ixodes scapularis* est endémique. Les températures fluctuent et ont parfois atteint +4 °C. Quand doit-on commencer à utiliser des produits préventifs contre les tiques?

Tout d’abord, il est important d’informer les propriétaires d’animaux que les tiques sont actives dès que le thermomètre indique 4 °C ou plus, et qu’ils devraient vérifier quotidiennement la présence de tiques sur leurs animaux et sur eux-mêmes dès que les températures dépassent le point de congélation.

Lorsque la température demeure supérieure à 4 °C — comme cela a été le cas, par exemple, en décembre dernier ou à la fin du mois de mars dans la plupart des régions du Canada —, il est judicieux de commencer (ou, dans le cas du mois de décembre, de continuer) à utiliser des produits préventifs. Dans les régions à risque pour la maladie de Lyme, et pour les clients qui voyagent dans ces régions, la vaccination devrait aussi être envisagée.

Idéalement, on recommande une approche à trois volets pour maîtriser les tiques et réduire le risque de transmission d’agents pathogènes. En ordre d’importance, les trois volets sont : 1) la vigilance et la surveillance quotidienne de la présence de tiques; 2) l’emploi de produits préventifs, si la température est propice aux tiques; 3) la vaccination, s’il y a un risque significatif d’exposition (p. ex., pour les animaux vivant dans une région où la maladie de Lyme est établie ou voyageant dans une telle région).

Étant donné que la température peut fluctuer grandement durant l’hiver et qu’il n’est pas rare qu’elle s’élève au-dessus du point de congélation, voire même au-dessus de 4 °C, recommander des mesures de maîtrise des tiques pendant toute l’année est une conclusion logique dans beaucoup de régions d’Amérique du Nord.

3. Devrait-on soumettre régulièrement des tiques au Laboratoire national de microbiologie (ou à un autre laboratoire) aux fins d’identification?

Cela dépend de la région dans laquelle vous vous situez. Si vous êtes dans une région où les populations de tiques sont en train d’être établies, il serait intéressant que vous le fassiez. Si vous êtes plutôt dans une région où les tiques *Ixodes* sont déjà établies, soumettre des tiques aux fins d’identification a moins d’intérêt.

Les unités de santé publique locales varient beaucoup — certaines souhaitent que toutes les tiques soient soumises aux fins d’identification et de dépistage, tandis que d’autres ne veulent pas en recevoir du tout. Encore une fois, cela dépend de l’endroit où vous vous situez. C’est pourquoi nous recommandons de vous informer auprès de votre unité de santé publique pour connaître la politique en vigueur et savoir si la soumission de tiques est encouragée ou non dans votre région.

4. Qu’en est-il des régions où il n’y a pas de population de cerfs de Virginie? À quel point doit-on se préoccuper de la prévention des tiques chez les animaux de compagnie dans ces régions?

Comme les cerfs de Virginie jouent un rôle important dans l’établissement des populations de tiques à pattes noires dans une région donnée, il est peu probable de trouver ces tiques dans les régions où ces cerfs sont complètement absents (l’Île-du-Prince-Édouard, par exemple).
disease-infected *I. scapularis* are distributed across Canada every spring. Even in areas where white-tailed deer are absent, and where it is unlikely that large populations will become established, there can still be a risk of exposure to ticks brought in by birds.

5. How effective is a Lyme disease vaccine? What vaccine strategy do you recommend?

All of the currently available Lyme disease vaccines do a fairly good job at preventing Lyme disease and seroconversion. That being said, each vaccine has its own specific attributes.

At Thousand Islands Veterinary Services, we use a 3-pronged approach, and have had excellent success in preventing seroconversion and clinical disease.

In this order, we:

1) Educate clients about what ticks look like, and about the importance of checking themselves and their dogs for ticks on a daily basis.

2) Use a tick preventive product when we know there is a potential risk of exposure — ideally BEFORE ticks are found on dogs. (It is predicted that, by the year 2020, 80% of the population in eastern Canada will live in areas with established blacklegged tick populations. The time to start implementing effective tick prevention programs in your area is now!)

3) Consider vaccination in areas where there are well-established *Ixodes scapularis* tick populations nearby or moving in, or in dogs that often go to areas with well-established tick populations.

Rather than focusing on individual vaccines, we focus on the entire program, and have had excellent success.

6. Are there any areas in Canada with established *Amblyomma americanum* populations?

Populations of this tick have been moving northward in the eastern United States. *Amblyomma americanum* ticks (also known as Lone Star ticks) have been found in Wisconsin, Michigan, New York State, and Maine, and distribution maps show them coming close to the Canadian border.

Although *Amblyomma americanum* ticks can sporadically be found in Canada, at this time their numbers remain low and there are no known established populations. This may change in the future, given the progressive northward expansion of this tick species and its close association with white-tailed deer populations.

The expansion of this tick’s range is currently being monitored.

7. Is there a way to tell ticks apart without having to send them to a diagnostic laboratory?

You can learn how to identify ticks in your clinic! Looking at the scutum (the hard protective area on the back of the tick), as well as examining the mouthparts are 2 simple ways to determine if a tick is from the *Dermacentor* or *Ixodes* species.

Pourtant, les populations de cerfs de Virginie sont-elles si importantes? Parce que ces animaux sont la source de la grande majorité des repas de sang pour les tiques adultes femelles, ce qui contribue à l’explosion des populations de tiques dans un endroit donné. Même dans les régions du Canada où les cerfs de Virginie ne sont pas une espèce endémique, il est possible de trouver des populations isolées de cerfs à certains endroits, tels que dans des parcs provinciaux ou des fermes privées.

De plus, il est fort probable que des oiseaux migrateurs transportent des tiques dans ces régions, ce qui présente un risque certain, surtout compte tenu du fait que les petits mammifères (souris à pattes blanches, ratons laveurs, marmottes, etc.) peuvent permettre la poursuite du cycle de vie des tiques et, par conséquent, l’établissement d’une population de tiques — bien que de façon moins explosive que dans les régions habitées par des cerfs de Virginie.

Les oiseaux migrateurs sont maintenant reconnus comme étant un facteur important dans la dispersion des tiques *Ixodes scapularis* dans l’est du Canada. On estime que des millions de tiques *I. scapularis* infectées par la bactérie qui cause la maladie de Lyme sont distribuées ainsi dans l’ensemble du pays chaque printemps. Ainsi, même dans les régions où il n’y a pas de cerfs de Virginie et où il est peu probable que de grandes populations deviennent établies, il existe un risque d’exposition aux tiques transportées par les oiseaux.

5. À quel point le vaccin contre la maladie de Lyme est-il efficace? Quelle stratégie vaccinale recommandez-vous?

Tous les vaccins contre la maladie de Lyme actuellement sur le marché sont relativement efficaces pour prévenir la maladie de Lyme et la séroconversion. Cela dit, chaque vaccin a ses propres caractéristiques.

Chez Thousand Islands Veterinary Services, nous utilisons une approche à trois volets et nous avons eu d’excellents résultats pour prévenir la séroconversion et la maladie clinique. Ces trois volets, en ordre d’importance, sont les suivants :

1) Éduquer les clients sur l’apparence des tiques et sur l’importance de vérifier quotidiennement la présence de tiques sur eux-mêmes et sur leurs chiens.

2) Utiliser un produit préventif contre les tiques s’il y a un risque d’exposition — idéalement AVANT que des tiques soient trouvées sur les chiens. (On estime que d’ici 2020, 80 % des habitants de l’est du Canada vivront dans des régions où des populations de tiques à pattes noires sont établies. Il faut donc commencer à mettre en œuvre des programmes de prévention des tiques efficaces dès maintenant!)

3) Envisager la vaccination près des endroits où des populations de tiques *Ixodes scapularis* sont établies ou sont en voie d’établissement, ainsi que chez les chiens qui vont régulièrement dans des régions où il y a des populations de tiques établies.

Au lieu de nous concentrer sur un vaccin en particulier, nous mettons l’accent sur le programme dans son ensemble, et nous avons eu d’excellents résultats.

6. Y a-t-il des régions au Canada où il y a des populations établies de tiques *Amblyomma americanum*?

Les populations de tiques *Amblyomma americanum* (aussi appelées tiques étoilées d’Amérique) se déplacent vers le nord...
Dermacentor andersoni and D. variabilis ticks have a brown and white, or ornate, scutum and short mouthparts. *Ixodes pacificus* and *I. scapularis* ticks, on the other hand, have a solid brown scutum and long mouthparts.

When female ticks take a blood meal, the appearance of their body can range from beige, to grey, to a deep purple/black at full engorgement, regardless of species. However, their scutum and mouthparts remain the same, which is why identification should be based on these parts rather than on the color of their body.

There are several excellent resources available online to assist in the identification of ticks, including (www.tickencounter.org).

8. Can cats get ticks too? Do they get Lyme disease?

Yes, cats can get ticks too. *Ixodes scapularis* will readily feed on cats. Although cats can seroconvert following exposure to *Borrelia burgdorferi*, at present it does not appear that they develop clinical disease.

That being said, large numbers of nympha *Ixodes scapularis* have been found parasitizing cats, especially around the ear margins and eyelids. Infestations of this type can be quite debilitating to cats.

9. Do ticks die in the winter?

Blacklegged ticks can survive exposure to air temperatures as low as −10°C. They weather the elements by hiding under leaf litter, other ground cover or snow cover, to protect themselves from extreme temperatures.

Even in parts of Canada where winters can be very cold, if snow cover is sufficient, ticks will remain dormant and become active again when temperatures are appropriate for them.

Typically, extremely cold and dry winters will result in considerable winterkill of ticks, whereas milder, snowier winters will increase their chances of survival. While there is always some degree of winterkill, the percentage of tick populations that die off can vary greatly from year to year.

10. I’m used to seeing ticks in the spring, mainly the American dog tick, and have focused prevention efforts on that time of year. If there is *Ixodes scapularis* in my area, should I change my parasite-prevention strategy?

American dog ticks, or *Dermacentor variabilis*, tend to quest in the spring and summer only, starting in March–April and peaking in May–June. They are usually no longer questing by September. All stages (larvae, nymphs and adults) quest at roughly the same time. *Ixodes scapularis*, on the other hand, can be active in colder weather. Adult *Ixodes scapularis* ticks can be active from early fall through to the spring, as long as temperatures are appropriate for questing.

Adult *Ixodes scapularis* ticks are active when temperatures are above 4°C — and even lower than this, according to some studies. Nymphs of this tick species quest in the spring and early summer, whereas larvae are more active in the summer months. In other words, there is rarely a month of the year during which you will be unable to find an *Ixodes scapularis* tick.

In areas where *Ixodes scapularis* can be found, an important first step in tick prevention is making pet owners aware of the fact that ticks can be active at 4°C and above, and that they should perform daily tick checks on themselves and on their dogs when temperatures are above the freezing mark. When we have days during which temperatures are consistently above
J’ai l’habitude de voir des tiques au printemps, surtout des tiques américaines du chien, et je concentre mes efforts de prévention à ce moment de l’année. S’il y a des tiques *Ixodes scapularis* dans ma région, est-ce que je devrais modifier ma stratégie de prévention des parasites?

Les tiques américaines du chien (*Dermacentor variabilis*) ont tendance à chercher des hôtes au printemps et à l’été seulement. Leur période d’activité commence en mars ou avril, pour atteindre son point maximal en mai ou juin. Habituellement, ces tiques ne cherchent plus d’hôte en septembre. Tous les stades de développement de cette espèce — larves, nymphes et adultes — sont à la recherche d’un hôte environ au même moment.

Quant aux tiques *Ixodes scapularis*, celles-ci peuvent être actives par temps plus froid. En effet, les tiques *Ixodes scapularis* adultes peuvent être actives du début de l’automne jusqu’au printemps, à la condition que les températures soient adéquates pour la recherche d’un hôte.

Les tiques *Ixodes scapularis* adultes sont actives quand la température est supérieure à 4 °C — voire moins, d’après certaines études. Les nymphes de cette espèce cherchent un hôte au printemps et au début de l’été, tandis que les larves sont surtout actives durant les mois d’été. Autrement dit, il y a rarement un mois de l’année pendant lequel il est impossible de trouver une tique *Ixodes scapularis*.

Dans les régions où les tiques *Ixodes scapularis* sont présentes, la première étape importante de la prévention des tiques est d’informer les propriétaires d’animaux du fait que les tiques sont actives dès que la température atteint 4 °C, et de les encourager à vérifier quotidiennement la présence de tiques sur eux-mêmes et sur leurs animaux dès que les températures dépassent le point de congélation. Lorsque la température demeure supérieure à 4 °C — comme cela a été le cas, par exemple, au mois de décembre dernier ou à la fin du mois de mars, dans la plupart des régions du Canada —, il est judicieux d’utiliser des produits préventifs.

Dans la plupart des régions du Canada, le traitement de mars à décembre devrait offrir aux chiens la protection dont ils ont besoin pendant la plus grande partie de la période de risque associée aux tiques.

La communauté vétérinaire est dans une position unique pour prendre un rôle de leadership dans la lutte contre les tiques.

**Le MOIS NATIONAL DE SENSIBILISATION AUX TIQUES** est une initiative de l’Association canadienne des médecins vétérinaires, en partenariat avec Merck Santé animale.
Celebrate Registered Veterinary Technicians across Canada during National Vet Tech Week October 16–22, 2016

The week to celebrate and recognize veterinary technologists/technicians across the country is National Vet Tech Week from October 16 to 22, 2016!

Registered veterinary technicians (RVTs) contribute greatly to animal health and welfare throughout our nation. National Vet Tech Week provides an opportunity to recognize and honor the individuals who commit to higher standards of medical care for our animals, contribute to the profession, and improve client service.

RVTs play an instrumental role in caring for animals, whether working in a veterinary hospital, wildlife center, research facility, ranch, the Canadian Food Inspection Agency, academia or any of the other wide variety of sectors the profession may offer. All RVTs deserve to be recognized for the improvements and care they have shown the profession and as champions for all animals.

The Registered Veterinary Technologists and Technicians of Canada (RVTTC) celebrates 23 years of recognizing National Vet Tech Week. Be sure to congratulate and thank your fellow RVTs for their passion and dedication.

The RVTTC’s mission is to unite, advance and strengthen the RVT profession in Canada. Take this week to celebrate and thank your local registered veterinary technologist/technicians today! For more information, contact Shannon Brownrigg, RVT, RVTTC/TTVAC, executive director, at 613-215-0619 or e-mail (sbrownrigg@rvttcanada.ca).

(by Heather L. Shannon, RVT, Vice President, Registered Veterinary Technologists and Technicians of Canada)
What have you learned through the CVMA's Online Education Portal?

CVMA members have access to a global network of education resources from global veterinary experts and education institutions. With over 900 e-learning sessions on the new CVMA Online Education Portal, members can select sessions based on refined search criteria such as specialty, accreditation, minimum duration, type of education, and free or paid. There’s also a tracker tool that records completed continuing education (CE) activities in your account profile.

This great platform for CVMA members provides veterinary CE that’s convenient, flexible, accessible, and economical and helps fulfill your professional requirements.

Access the CVMA Education Portal on the CVMA website (www.canadianveterinarians.net) under the Science & Knowledge tab. Once you click the link, you will be prompted to enter your CVMA log-in information before being redirected to the portal. Once on the portal, you can create your account and start browsing the sessions.

CVMA’s leadership in the delivery of science and knowledge enhances the lifelong learning and career development of veterinarians, and the CE offered through the CVMA Online Education Portal creates additional value for our members.

For additional information, or if you don’t know or forget your CVMA password, contact the CVMA Member Services at 1-800-567-2862 or e-mail (admin@cvma-acmv.org).

Qu’avez-vous appris sur le Portail d’éducation en ligne de l’ACMV?

Les membres de l’ACMV ont accès à un réseau mondial de ressources éducatives provenant d’experts vétérinaires et d’établissements d’enseignement de toutes les régions du monde. Avec plus de 900 ateliers de cyberapprentissage sur le nouveau Portail d’éducation en ligne de l’ACMV, les membres peuvent choisir des ateliers en fonction de critères de recherche précis comme la spécialité, l’agrément, la durée minimum, le type de formation et s’il s’agit d’une formation gratuite ou payante. Il y a aussi un outil qui permet d’effectuer le suivi des activités de formation continue dans votre profil de compte.

Cette excellente plateforme pour les membres de l’ACMV fournit une formation continue vétérinaire qui est pratique, flexible, accessible et économique et elle vous aide à respecter les exigences professionnelles.

Vous pouvez accéder au Portail d’éducation de l’ACMV sur le site Web de l’ACMV (www.veterinairesacanada.net) sous l’onglet Science et connaissances. Une fois que vous avez cliqué sur le lien, on vous demandera d’entrer vos données de connexion de l’ACMV avant de vous rediriger vers le portail. Une fois sur le portail, vous pouvez créer votre compte et commencer à explorer les ateliers.

Le leadership de l’ACMV dans la présentation de la science et des connaissances rehausse l’apprentissage continu et la progression de la carrière des vétérinaires et la formation continue offerte sur le Portail d’éducation en ligne de l’ACMV représente une valeur ajoutée pour nos membres.

Pour en savoir davantage, ou si vous ne connaissez pas votre mot de passe de l’ACMV ou si vous l’avez oublié, contactez les Services aux membres de l’ACMV au 1-800-567-2862 ou par courriel (admin@cvma-acmv.org).
Distinguished Veterinarian, Dr. Ole Nielsen, Appointed as a Member of the Order of Canada

On Canada Day, Governor General David Johnston announced that Dr. Ole Nielsen, 1968/1969 CVMA president, has been appointed as a Member of the Order of Canada — one of the country’s highest civilian honors.

Dr. Nielsen is well respected in the veterinary profession for his broad vision of Global Health.

He is not only a well-accomplished veterinarian, but past dean of the Western College of Veterinary Medicine, as well as past dean at the Ontario Veterinary College. His time in both positions showcased his value of the work of public sector veterinarians.

His term as the president of the Canadian Veterinary Medical Association (CVMA) from 1968 to 1969 was much respected. Dr. Nielsen was presented a Life Membership to the association for his long-standing commitment to the CVMA and for his exceptional contributions to the veterinary profession.

His hobby of pottery also highlights his passion for the veterinary profession. His craft, which he started in the 1970s, has helped raise funds for the McEachran Fund for Ecosystem Health, a trust fund that he established in 2007 through the Canadian Cooperative Wildlife Health Centre (CCWHC).

Dr. Nielsen is a true visionary within his field. The CVMA extends our sincerest congratulations to Dr. Nielsen for receiving such a high honor.

Un vétérinaire distingué, le D’ Ole Nielsen, est nommé membre de l’Ordre du Canada


Le D’ Nielsen est hautement respecté au sein de la profession vétérinaire pour sa vision globale de la santé mondiale.

Il est non seulement un vétérinaire hautement accompli, mais il est aussi ancien doyen du Western College of Veterinary Medicine ainsi qu’ancien doyen de l’Ontario Veterinary College. Le temps passé dans ces deux postes a mis en lumière la valeur du travail des vétérinaires du secteur public.

Son mandat à la présidence de l’Association canadienne des médecins vétérinaires (ACMV), en 1968–1969, a été hautement respecté. Par ailleurs, le titre de membre à vie de l’Association a été décerné au D’ Nielsen pour son engagement de longue date envers l’ACMV et ses contributions exceptionnelles à la profession vétérinaire.

Dans ses temps libres, le D’ Nielsen s’adonne à la poterie et ce passe-temps souligne aussi sa passion pour la profession vétérinaire. Son artisanat, qu’il a commencé dans les années 1970, a recueilli des fonds pour le Fonds McEachran pour la recherche en santé des écosystèmes, un fonds en fiducie qu’il a établi en 2007 par l’entremise du Centre canadien coopératif de la santé de la faune (CCCSF).

Le D’ Nielsen est un véritable visionnaire dans son domaine et l’ACMV lui transmet ses félicitations les plus sincères pour l’attribution de cette haute distinction.
Plus de 100 délégués ont assisté à l'assemblée scientifique annuelle du Canadian Animal Health Laboratorians Network — Réseau canadien des travailleurs des laboratoires de santé animale (CAHLN-RCTLSA), du 5 au 8 juin, qui a été organisée par l'Atlantic Veterinary College (AVC) de l'Université de l'Île-du-Prince-Édouard à Charlottetown, à l'Île-du-Prince-Édouard. Le thème était «Collaboration pour le diagnostic vétérinaire et la santé animale» et les participants ont pu assister à 38 conférences et à la présentation de six affiches qui illustraient la valeur et les défis de la collaboration au niveau international, national et local. Le programme comptait aussi des mises à jour sur les progrès technologiques et les résultats de travaux de recherche dans le domaine du diagnostic vétérinaire et il a souligné les diverses facettes du développement d'épreuves diagnostiques pour l’aquaculture, l’épidémiologie et la gestion des maladies à l’AVC.

L’assemblée du CAHLN-RCTLSA a été précédée le 5 juin par l’assemblée annuelle de la Canadian Association of Veterinary Pathologists — L’Association canadienne des pathologistes vétérinaires (CAVP-ACPV), qui a porté sur les maladies du système respiratoire le matin, suivie de rapports de cas et de mises à jour provinciales. Cette même journée, le Dr Ian Gardner (Chaire d’excellence en recherche du Canada en épidémiologie aquatique à l’AVC) a présenté un atelier sur la validation du test diagnostique avant la conférence.

Le Dr Alfonso Lopez de l’AVC a été choisi comme récipiendaire du Prix du travailleur de laboratoire de l’année 2016 pour son service méritoire à la médecine vétérinaire de laboratoire. Il est originaire du Mexique où il a reçu son D.M.V., et il a obtenu ses diplômes de M.Sc. et de Ph.D. en pathologie vétérinaire à l’Ontario Veterinary College de l’Université de Guelph, en 1975 et en 1981, respectivement. En 1984, le Dr Lopez est retourné au Canada en provenance du Mexique pour travailler en tant que pathologiste vétérinaire à l’Alberta Environmental Centre, à Vegreville, en Alberta, où il est devenu directeur du Service de pathologie. En 1986, il est entré en fonction au Département de pathologie et de microbiologie de l’AVC, où il a poursuivi sa carrière jusqu’à sa retraite en 2015, quoiqu’il travaille toujours activement en recherche. Le Dr Lopez est un pathologiste exceptionnel, un enseignant extraordinaire et passionné et un mentor auprès des futurs vétérinaires et travailleurs de laboratoire et il a reçu de nombreux prix d’enseignement. Il s’est beaucoup impliqué au niveau de l’éducation internationale dans le domaine de l’aquaculture, l’épidémiologie et la gestion des maladies à l’AVC.

Dr. Alfonso Lopez (à droite) was presented with the 2016 CAHLN-RCTLSA Laboratorian of the Year Award by Dr. Jim Goltz (President of CAHLN-RCTLSA).

Le Dr Jim Goltz (président de CAHLN-RCTLSA) remet le Prix du travailleur de laboratoire de l’année 2016 du CAHLN-RCTLSA au Dr Alfonso Lopez (à droite).
Selected for the 2016 Laboratorian of the Year Award for his meritorious service to veterinary laboratory medicine was Dr. Alfonso Lopez of the AVC. Originally from Mexico where he received his DVM, he obtained his MSc and PhD in veterinary pathology at the Ontario Veterinary College, University of Guelph, in 1975 and 1981 respectively. Dr. Lopez returned to Canada from Mexico in 1984 to work as a veterinary pathologist in the Alberta Environmental Centre, Vegreville, Alberta where he became head of the Pathology Branch. In 1986, he moved to the Department of Pathology and Microbiology at AVC, where he continued his career until retirement in 2015, although he is still active in research. Dr. Lopez is an outstanding pathologist, and an outstanding and passionate educator and mentor of future veterinarians and laboratory technicians, receiving many teaching awards. He has been extensively involved in international education related to veterinary medicine. Throughout his career, Dr. Lopez has focused on research related to pathology of the respiratory system, investigating diseases such as human and feline asthma, the effects of fetal meconium aspiration, interstitial pneumonia in feedlot cattle and the effect of emu oil on the inflammatory response. He has been a member of the Editorial Board for the Canadian Veterinary Journal, Journal of Veterinary Medicine, Berlin, Germany and other international journals.

Two Graduate Student Presentation Awards were given out at the meeting. The best oral presentation award went to Cristina Solis Worsfold from the University of Calgary Faculty of Veterinary Medicine for her presentation “High-throughput automated analysis of virus neutralization assays against animal viruses.” The best poster presentation award of $200, generously donated by Dr. Ian Gardner, went to Iman Mehdizadeh Gohari from the Department of Pathobiology, University of Guelph for his poster “Comparative genomic and cgMLST analysis of netF-positive Clostridium perfringens isolates from foal and canine necrotizing enteritis.”

Conference participants put into practice the theme of collaboration as they enjoyed the lobster supper and Kitchen Party put on by their AVC hosts on Tuesday evening.

The 2017 meeting will be held in Guelph, Ontario. Updates will be posted on the website (www.cahln-rctlsa.com).
**Case Report** 

**Squamous cell carcinoma causing dorsal atlantoaxial spinal cord compression in a dog**

Yuta Miyazaki, Takeshi Aikawa, Masaaki Nishimura, Munetaka Iwata, Yumiko Kagawa

**Abstract** — A 12-year-old Chihuahua dog was presented for cervical pain and progressive tetraparesis. Magnetic resonance imaging revealed spinal cord compression due to a mass in the dorsal atlantoaxial region. Surgical treatment was performed. The mass was histopathologically diagnosed as a squamous cell carcinoma. The dog recovered to normal neurologic status after surgery.

**Résumé** — Carcinome squameux causant une compression de la moelle épinière altantoaxiale dorsale chez un chien. Un Chihuahua âgé de 12 ans a été présenté pour de la douleur cervicale et une tétraparésie progressive. Une imagerie par résonance magnétique a révélé une compression de la moelle épinière en raison d’une masse dans la région atlantoaxiale dorsale. Le traitement chirurgical a été réalisé. La masse a été diagnostiquée à l’histopathologie comme étant un carcinome squameux. Le chien a retrouvé une condition neurologique normale après l’opération.

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**Case description**

A 12-year-old, spayed female, Chihuahua dog weighing 2.4 kg was presented with a 10-day history of cervical pain and progressive tetraparesis. On admission, the dog was bright and alert, but was in pain and reluctant to move. There were no palpable cutaneous or digital masses. Palpable lymph nodes appeared normal in size and texture. Oral examination detected no mass lesions or swelling of the tonsils. Neurological examination revealed the dog to be ambulatory with moderate tetraparesis and severe ataxia. The cranial nerve examination findings were normal. Severe paraspinal pain was detected on deep cervical manipulation. In both thoracic and pelvic limbs, the postural reactions were decreased and the spinal reflexes were normal, suggestive of a C1–C5 myelopathy. The differential diagnoses included intervertebral disc disease, neoplasia, meningomyelitis, and fracture/luxation. Cervical radiographs showed a mass lesion dorsal to C1–C3, with bone lysis of the spinous process of the axis (11). Radiographs of the cranium, thorax and abdomen were unremarkable. Abdominal ultrasonography revealed no abnormal findings. Complete blood count (CBC) and serum biochemical panel were within normal limits. A computed tomography (CT) scan was performed using a 16-slice helical CT scanner (Brightspeed Elite; GE Healthcare, Milwaukee, Wisconsin, USA). The scanning parameters were as follows: slice thickness, 6.25 mm; reconstruction interval, 6.25 mm; helical pitch, 1.0; X-ray tube potential, 120 kV; X-ray tube current, 260 mA. Magnetic resonance imaging (MRI) was also performed using a 0.4 Tesla scanner (Aperto Inspire; Hitachi Medical, Tokyo Japan). T2-weighted images were acquired using a fast spin-echo (FSE) sequence at a repetition time (TR) of 2000 to 2500 ms, and an echo time (TE) of 112 to 120 ms. T1-weighted SE images were acquired using a 0.4 Tesla scanner (Aperto Inspire; Hitachi Medical, Tokyo Japan). T2-weighted images were acquired using a fast spin-echo (FSE) sequence at a repetition time (TR) of 2000 to 2500 ms, and an echo time (TE) of 112 to 120 ms. T1-weighted SE images were acquired at a TR of 405–406 ms and a TE of 13 ms before and after administration of 0.2 mL/kg body weight gadodiamide (Omniscan intravenous injection; Daiichi-Sankyo, Tokyo, Japan). The slice thickness was 3.0 to 3.5 mm. The images were acquired in sagittal and transverse...
planes. Computed tomography and MRI revealed a mass lesion dorsal to the atlantoaxial spine causing severe extradural spinal cord compression (Figure 2) and bone lysis of the dorsal lamina of the axis, thus primary vertebral tumors such as osteosarcoma, chondrosarcoma, myeloma, fibrosarcoma or metastatic tumors were suspected. On the fifth day of hospitalization, surgical resection of the mass and vertebral stabilization were performed.

The dog was placed under general anesthesia and positioned in sternal recumbency with the neck elevated. A dorsal surgical approach to the cranial cervical spine was made. The mass lesion was seen protruding between the biventer cervicis muscle and the obliquus capitis caudalis muscle. An en bloc excision of the mass with a 1-cm lateral margin including vertebral arches of the atlas, axis, and cranial part of the C3 was attempted, but complete excision was impossible because the mass migrated into the epidural space causing substantial adhesion to the dura mater. Dorso-lateral stabilization of the C1–C2 was performed bilaterally using positively threaded profile pins (Acrylic fixation pin; IMEX Veterinary, Longview, Texas, USA) and polymethylmethacrylate (Simplex P Bone Cement; Stryker Corporation, Kalamazoo, Michigan, USA) (Figure 3). Histopathologically, the tumor was composed of islands, cords, and trabeculae of neoplastic epithelial cells showing variable degrees of squamous differentiation towards the center of each focus. Tumor cells had abundant eosinophilic cytoplasm and ovoid nuclei with a single prominent nucleolus. These findings are characteristic of SCC (Figure 4). The tumor showed marked invasiveness and infiltration into the bone tissue and the boundary between tumor and normal tissues was unclear. No continuity of the skin and tumor was observed.

After surgery, the cervical pain was relieved. The ambulation was improved with slight ataxia and mild tetraparesis; the dog was discharged 5 d after surgery. The owner declined any adjuvant therapies. At suture removal 16 d after surgery, the dog was ambulatory with no evidence of cervical pain, and had neither ataxia nor proprioceptive deficits. A telephone interview with the owner revealed that the dog became nonambulatory several days after suture removal and died at home 32 d after surgery. Because no postmortem examination was performed, the cause of death was not determined.

**Discussion**

Canine SCC has been reported to occur at various anatomical sites (1), with different biological behaviors. In the present case, the mass lesion dorsal to the atlantoaxial spine causing spinal cord compression showed no continuity with the skin. Preoperative staging included a CBC, biochemical profile, exploration of the oral cavity, thoracic and abdominal radiographs, abdominal ultrasonography. Cervical CT and MRI were performed, but no primary or other metastatic lesions were detected.

Almost any carcinoma, other than SCC, can readily metastasize to bone (12–15). The lumbar vertebrae, femur, humerus, rib, and pelvis are common sites for metastasis, possibly because...
these are predilection sites for bone metastasis from the common urinogenital malignancies, such as mammary, prostate, and bladder cancer (14).

By contrast, reports of SCC causing bone metastasis in dogs are limited (11,16,17). There have been reports of tonsillar, skin, and gingival SCC that have metastasized to the distal humerus (16), thoracic and lumbar vertebrae (11), and multiple ribs (17), respectively. Oral SCC frequently invades bone, especially to the maxilla and mandible (18). However, SCC causing distant metastases to the vertebral is rare (11). There have been only a few reports of SCC that metastasize to the vertebrae in humans (19–21). In these cases, primary SCC sites were the tongue, gingiva, and retromolar, and metastatic lesions were identified in the lumbar, cervical to lumbar, and cervical to thoracic vertebrae, respectively.

In dogs, there is only 1 report describing SCC of the skin over the right scapular-humeral joint with metastases to the thoracic and lumbar vertebrae and subsequent spinal cord compression (16). Cooley et al (13) reported on 19 dogs with skeletal carcinoma, in which skeletal metastasis was the initial clinical manifestation of neoplastic disease. Of these 19 dogs, only 1 had a lesion in the cervical spine but the primary tumor was unknown. Similar to the present case, neurological dysfunction secondary to metastatic carcinoma was the initial clinical manifestation. Skeletal metastasis representing the initial clinical manifestation prior to a diagnosis of carcinoma of unknown origin is recognized in humans, and accounts for 3% to 4% of metastatic carcinomas (22–26). These reports highlight the potential difficulty in identifying the origin of the tumor, despite an extensive diagnostic workup. It should be noted that although...
oral exploration revealed no mass lesions of the oral cavity or tonsils, we could not rule out the possibility that there was a primary tumor in these sites.

The aim of surgery was to excise the mass with clean margins, to decompress the spinal cord, and to stabilize the atlantoaxial joint if needed. However, complete mass excision was impossible because of invasion of the mass into the epidural space. A dorsal approach to the atlantoaxial joint has been reported (27,28). A disadvantage of this technique is that fusion of the atlantoaxial joint cannot be achieved because the articular surfaces remain intact (28). Furthermore, transarticular pins cannot be inserted. Because of these limitations when stabilizing the atlantoaxial joint from a dorsal approach, we increased the number of pins inserted into the vertebral bodies. Palliative treatment options included the use of opioid, non-steroidal anti-inflammatory drugs (13), bisphosphonates (29), or palliative fractionated radiotherapy (30). In the present case, palliative fractionated radiotherapy was declined by the owner.

This report describes the clinical signs, neurological findings, imaging findings, surgical approach and outcome in a dog with cervical pain and tetraparesis as the initial clinical manifestation caused by SCC. We could not determine whether this was an atypical location of a solitary primary SCC lesion or a metastatic lesion from an unidentified SCC. It should be noted that the staging was incomplete, and no postmortem examination was performed. In patients with a suspected skeletal neoplastic lesion, it is important that a thorough physical examination, detailed imaging and complete staging be performed. Retrospectively, fine-needle aspiration of a regional lymph node might have been warranted, even though there was no palpable regional lymphadenopathy. In this case, the dog showed postoperative neurologic recovery, but the long-term prognosis was poor.

To our knowledge, this is the first case of SCC causing cervical vertebral invasion and subsequent spinal cord compression in a dog; this may be considered as an uncommon differential diagnosis for dogs with cervical myelopathy.

Acknowledgment

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References

Case Report  Rapport de cas

Perineal evisceration secondary to a bite injury in a dog with an untreated perineal hernia

Daniel McCarthy, Cassie Lux, Rachel Seibert

Abstract — Emergency surgery was performed on a 6-year-old castrated male springer spaniel dog with evisceration of most of the small intestinal tract through the perineal region, secondary to a dog attack. This is the first report describing successful treatment of perineal evisceration secondary to dog attack at an untreated perineal hernia, employing abdominal and perineal approaches.

Perineal herniation is a result of muscular pelvic diaphragm weakness, permitting herniation of pelvic and abdominal contents into the perineal region. Other factors including rectal disease, prostatic disease, and bladder disease may also play a role (1–3). Although many dogs with perineal hernias are asymptomatic, with the exception of noticeable perineal swelling, prompt surgical intervention is recommended to avoid complications. The reported complication rate of untreated perineal hernias ranges from 10% to 61% (1,2,4–6), and complications include urinary and fecal incontinence, strangulation and ischemia of entrapped organs, bladder reflexion resulting in metabolic derangements, bladder atony, and rectal diverticulum, dilatation, and prolapse (1,2,4–6). To the authors’ knowledge, evisceration of displaced organs contained within a perineal hernia, secondary to trauma, has not been described in the literature. The following case report describes evisceration as a consequence of a bite wound in the location of a chronic, untreated perineal hernia in a dog.

Case description

A 27-kg, 6-year-old male castrated springer spaniel dog was presented to an emergency clinic immediately after being attacked and bitten by another dog. The patient was diagnosed with perineal evisceration, stabilized, and given broad-spectrum antibiotics [enrofloxacin (Baytril; Bayer, Shawnee Mission, Kansas, USA), 10 mg/kg body weight (BW), IV, once; and ampicillin-sulbactam (Unasyn; Auromedics, Dayton, New Jersey, USA), 20 mg/kg BW, IV, once]. Approximately 76 cm of intestine were eviscerated from a bite wound located in the perineal region. The dog was referred for further assessment and surgery.

Upon arrival at the hospital 5 h after the dog attack, a detailed history revealed that the patient suffered from bilateral perineal hernias that had been present for approximately 1.5 y. The right perineal hernia was surgically addressed 12 mo earlier, but the left was untreated. The patient had been experiencing intermittent dyschezia, and the bilateral perineal hernias were visible to the owners as large swellings after surgical therapy, suggesting a defect in the previous surgical repair. Physical examination on presentation revealed tachycardia, prolonged capillary refill time, hypertension likely attributable to pain, and observation of small intestine and ascending colon herniated from the left perineal region (Figure 1), visibly contaminated with plant matter and debris. There appeared to be vascular compromise to the visible bowel from damage to the jejunal vascular arcade, and small lacerations and punctures were noted in the bowel loops. Multiple wounds were noted bilaterally in the perineal region including both the eviscerated hernia side, the previous right herniorrhaphy region, and circumferentially surrounding the anal sphincter. The patient was depressed but responsive to stimuli and able to stand.

Diagnostic tests included complete blood (cell) count (CBC), serum chemistry, and coagulation panel. Significant abnormalities included a moderate leukocytosis characterized by a mature...
neutrophilia ($17.6 \times 10^3/\mu L$; reference interval (RI): 5.1 to $14 \times 10^3/\mu L$), hyperglobulinemia (35 g/L; RI: 20 to 32 g/L), elevated aspartate aminotransferase (AST, 148 U/L; RI: 15 to 51 U/L), and elevated creatine kinase (4657 U/L; RI: 49 to 324 U/L). Abnormalities were attributed to an acute inflammatory process and muscle trauma. The dog had a history of bilateral perineal hernias; the right hernia had been surgically addressed 12 mo previously. The left perineal hernia was left untreated. Most of the small intestine and a portion of large intestine were eviscerated through the left perineal hernia defect.

The patient was premedicated with fentanyl and begun on a fentanyl (Akorn) CRI: 7.5 $\mu g$/kg BW per hour, anesthetized with ketamine (MWI Veterinary Supply, Boise, Idaho, USA), 0.5 mg/kg BW, IV, once, and midazolam (Hospira, Lake Forest, Illinois, USA), 0.5 mg/kg BW, IV, once, and maintained on inhalant isoflurane (Abbott). The patient was aseptically prepared for both a routine abdominal approach as well as a perineal approach. The eviscerated contents were cleaned using 0.05% chlorhexidine solution (Chlorhexidine; MWI Veterinary Supply). The patient was placed in dorsal recumbency, and a ventral midline exploratory was made from the xiphoid to the pubis. A complete exploratory celiotomy was performed, noting absence of the urinary bladder and most of the intestinal tract from their normal anatomic locations. The colon and rectum were located within the hernia and were dilated and sacculated. Most of the small intestine and a portion of the ascending colon were eviscerated through the hernia site. The herniated contents were gently replaced into the abdomen using cranial traction. The entire jejunum was congested and red to purple in comparison to surrounding bowel, the vascular arcade contained severe edema within the surrounding mesentery, no arterial pulses were palpable, and the proximal ileum and jejunum both sustained puncture and laceration trauma to their walls. For this reason, the entire jejunum and proximal ileum were deemed non-viable. This section (approximately 76 cm of small intestine) was resected with 2- to 3-cm margins of healthy tissue, ligating the arcadic vessels using a bipolar vessel sealing device (LigaSure small jaw open instrument; Covidien, Boulder, Colorado, USA). A duodenal-ileal, end-to-end anastomosis was completed and the anastomosis was closed with a simple interrupted pattern using 3-0 polydioxanone (PDS; Ethicon, Somerville, New Jersey, USA). The anastomosis site was leak tested, with no leakage noted. The urinary bladder was also found to be herniated into the perineal hernia site, though it was not eviscerated. The urinary bladder was catheterized with a sterile, 5 French red rubber catheter in a retrograde fashion in order to decompress and gently retract it into the abdominal cavity for assessment. The urinary bladder was carefully inspected for ischemia and areas of leakage; neither was found. Both a cystopexy and colopexy were performed. To initiate the colopexy, scarification of the colonic serosa for 2 cm using the blunt side of a scalpel blade, and incision into the superficial left lateral abdominal wall for 2 cm were performed. For the right-sided cystopexy, scarification and incision were performed in a similar manner to the colon between the bladder neck and right lateral abdominal wall. For completion of both the cystopexy and colopexy, a simple interrupted appositional suture pattern using 3.0 PDS was placed partial thickness through the colonic and urinary bladder walls and abdominal wall musculature on their respective sides. Approximately 4 L of warm physiologic saline was used to repeatedly irrigate the abdomen until the fluid appeared clear. An omentopexy was used to further secure the duodenal-ileal anastomosis site. A closed suction drain (Jackson Pratt wound drainage system; Cardinal Health, Dublin, Ohio, USA) was placed, and the abdomen was closed routinely.

The patient was repositioned into sternal recumbency. The external bite wound communicating with the perineal hernia was to the left of the rectum; this area was explored first. The left anal mucosa and distal 3 to 4 mm of external anal sphincter muscle were torn and communicating with the bite wound; this area was debrided. The only remaining tissue within the area was herniated abdominal fat, and this was reduced during placement of 3-0 PDS (Ethicon) stay sutures. Because of concern for overall patient stability under anesthesia, as well as for prolonging anesthetic time in a septic patient, it was elected to perform primary herniorrhaphy of the pelvic diaphragm in order to decompress and gently retract it into the abdominal cavity for assessment. The urinary bladder was carefully inspected for ischemia and areas of leakage; neither was found. Both a cystopexy and colopexy were performed. To initiate the colopexy, scarification of the colonic serosa for 2 cm using the blunt side of a scalpel blade, and incision into the superficial left lateral abdominal wall for 2 cm were performed. For the right-sided cystopexy, scarification and incision were performed in a similar manner to the colon between the bladder neck and right lateral abdominal wall. For completion of both the cystopexy and colopexy, a simple interrupted appositional suture pattern using 3.0 PDS was placed partial thickness through the colonic and urinary bladder walls and abdominal wall musculature on their respective sides. Approximately 4 L of warm physiologic saline was used to repeatedly irrigate the abdomen until the fluid appeared clear. An omentopexy was used to further secure the duodenal-ileal anastomosis site. A closed suction drain (Jackson Pratt wound drainage system; Cardinal Health, Dublin, Ohio, USA) was placed, and the abdomen was closed routinely.

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Weakening of the levator ani muscle can play a significant role before surgery. The puncture wounds in the swollen right perineal hernia region were explored, and it was decided to perform a herniorrhaphy in a similar manner to the left side, as the pelvic diaphragm was not intact in this location. Additional small puncture wounds and lacerations communicating with the right and left explored regions in the perineal area were cleaned, debrided, and left open to heal by second intention. Due to these open wounds, a Jackson-Pratt drain was not placed in this area for lack of retention of negative pressure.

The patient recovered for the next 3 d in the intensive care unit. Postoperative care included famotidine (Pepcid; McNeil, Fort Washington, Pennsylvania, USA), 1 mg/kg BW, IV, q12h, amoxicillin/clavulanate (Clavamox; Zoetis, Florham Park, New Jersey, USA), 19 mg/kg BW, PO, q12h, metronidazole (Flagyl; Pfizer, New York, New York, USA), 9 mg/kg BW, PO, q12h, fentanyl (Akorn), 2.5 to 7.5 μg/kg BW per hour, IV, CRI titrated to effect, gabapentin (Neurontin; Pfizer), 11 mg/kg BW, PO, q8h, and tramadol (Tramadol; Trigen, Sayreville, New Jersey, USA), 5 mg/kg BW, PO, q8h. The patient was discharged from the hospital with gabapentin and tramadol to be used as needed for pain and amoxicillin/clavulanate (Zoetis) to be given for an additional 7 d. The closed suction drain was monitored for fluid production every 4 to 6 h while it was in place. By the end of the second postoperative day, the drain production had diminished markedly (6 mL in 24 h), and the fluid grossly was non-viscous and serosanguinous. Due to the cytological features of the fluid (absence of non-degenerate neutrophils with no bacteria present), the cardiovascular stability of the patient, normoglycemia, alert mentation, and return of the dog’s appetite, it was deemed highly unlikely that the fluid being produced was septic and the drain was removed. By the third postoperative day, the patient was comfortable, ambulating and eating well, and was discharged from the hospital. At the 2-week follow-up examination, all surgery sites were completely healed, and the patient was eating, drinking, and behaving normally, with the exception of intermittent diarrhea. On rectal examination, there was no evidence of palpable perineal hernia, or rectal diverticulum. The owner was contacted by telephone 12 wk after surgery and reported the patient to be free of clinical signs, with the diarrhea having resolved. Short bowel syndrome was a concern at the time of surgery given the length of bowel removed; however, it was a less significant concern with resolution of the diarrhea. The owner reported that the perineal area appeared normal with no apparent swelling or bulging, and the dog was no longer experiencing tenesmus or dyschezia as it was before surgery.

Discussion
Weakening of the levator ani muscle can play a significant role in the formation of perineal hernias; however, exact etiologies of pelvic diaphragm musculature failure are uncertain (7). Predisposing factors include conditions resulting in urinary straining or tenesmus such as prostatitis, cystitis, urinary tract obstruction, colorectal obstruction, diarrhea, and constipation (8). Recent studies have shown that intact males secrete increased relaxin, which has direct effects on relieving pelvic muscle tension, potentially predisposing them to the condition (9). Merchov (9) reports that relaxin hormone receptors are up-regulated in the coccygeus, levator ani, and the internal obturator muscles in dogs with perineal hernia.

Several surgical interventions for perineal hernias have been described. The internal obturator muscle transposition flap is considered the gold standard, having the highest reported success rate and lowest recurrence rate (2.4% to 19%) (10,11). Other repair methods include primary herniorrhaphy (45% recurrence rate); superficial gluteal flap (36% recurrence rate); semimembranosus muscle transposition (12,13) (2 successful cases reported); use of implants for defect repair (9) (synthetic mesh — 12.5% reported recurrence rate), porcine small intestinal submucosa (11 successful cases reported), fascia lata graft (10 successful cases reported), and porcine dermal collagen (7,8,14,15); and urinary bladder, colon, or ductus deferens pexy (4–6). A 2-step protocol has been described in which an abdominal approach is employed to perform colopexy, cysto-pexy, and in some cases, a vas deferens pexy, prior to addressing the hernia (16,17). The 2-step protocols have been shown to reduce recurrence rates (16,17). By securing the colon to the abdominal wall musculature and retracting it cranially, the rectal diameter is reduced, resulting in a reduced accumulation of feces and a decreased amount of pressure on the pelvic diaphragm (2). Colopexy also reduces the incidence of rectal prolapse, which has been reported in up to 42% of patients after surgery (16). Although there is conflicting evidence, 1 study documented an increased mortality rate in patients with bladder retroflexion (18), supporting the evidence in favor of performing cysto-pexy, particularly in patients with bladder retroflexion. Cysto-pexy and colopexy were performed in this patient for several reasons: a concurrent abdominal approach was required to address evisceration, the procedures are simple and did not add significant time to the overall procedure, and this patient had a retroflexed bladder as well as dilated colon and rectum located within the hernia. The nature of the wounds in this case did not allow neglect of the perineal disease at the time of the first surgical procedure. Since the perineal wound needed to be decontaminated and assessed, it was decided to perform a primary herniorrhaphy, with the potential for a second surgical procedure if the perineal hernia recurred.

Previously mentioned complications of untreated perineal hernias were not experienced in the patient prior to presentation. One proposed theory to explain why the patient did not show more clinical signs may be that intermittent displacement of the bowel and urinary bladder occurred within the herniation site and were transient enough to prevent any clinical signs from occurring. Another is that the patient was showing clinical signs not observed by the owner and was able to adapt to these changes. In the authors’ experience, retroflexion of the bladder (although less common) can occur without obstruction of the urethra. The owners reported dyschezia before the dog attack.
Potentially this was a product of the displacement of the bowel. However, the owners may have noted “straining” and assumed all of these signs were related to defecation, while the dog may also have been straining to urinate intermittently. Another possibility is that other organs such as rectum and colon were displaced within the site when it was a closed hernia and this prevented significant small bowel and persistent urinary bladder retroflexion into the herniation site.

Chronic bilateral perineal hernias have both high recurrence and complication rates, and consequently, surgical correction should be focused on preventing recurrence by use of internal obturator or vascularized muscle flaps (7,11–13,19). Ideally, the perineal site would have been addressed using an internal obturator flap at a later date in a true 2-step fashion in order to minimize anesthesia and surgery time; however, in this unique case, the wounds in the perineal area needed immediate surgery to prevent significant small bowel and persistent urinary bladder prolapse (9%).

A study in humans reported that although the chlorhexidine that was used for preoperative preparation was elected rather than internal obturator flaps or other reconstructive techniques that may have been more time and labor intensive. Additionally, the exposure of infection to an internal obturator flap may have resulted in failure of this repair, had it been pursued at the initial surgery. Had this occurred, it would have resulted in a more complicated repair in the future for this dog. It was discussed with the owners that a second surgical repair may need to be performed after recovery from the initial trauma if the hernia recurred (16,17), although the colopexy and cystopexy were performed to help prevent perineal hernia recurrence (16,17).

The chlorhexidine that was used for preoperative preparation of the affected abdominal organs is labeled for use on skin and external wound cleansing only, therefore the chlorhexidine was used “off-label.” There are studies documenting safety of use in abdominal organ lavage and intraluminal bladder lavage (20,21). A study in humans reported that although the chlorhexidine lavage did not improve outcome, there were no complications attributed to its use (20). Another report in which mice were used as an experimental model reported that postoperative peritoneal lavage with chlorhexidine reduced mortality by 50% compared to a control group (22).

Reported complications of perineal hernia treatment include recurrence (up to 45% incidence), incisional infection (17%), urinary (8%) and fecal (10%) incontinence, sciatic nerve damage (6%), strangulation of entrapped organs, bladder retroflexion (29%), bladder atony, rectal diverticulum, dilatation and prolapse (9%), and inadvertent prostatectomy (1,2,16–18,23). Perineal evisceration is rare and has yet to be reported in the veterinary literature, likely because small animal, veterinary patients typically have a large amount of adipose tissue, muscle, and fascia between the perineal skin and abdominal cavity. Therefore, while this complication is unusual, it is important to consider that untreated perineal hernia sites may predispose patients to catastrophic injury due to the proximity of abdominal organs to the skin if a traumatic episode were to occur. While a bite wound in this location in a dog without a hernia may have been minor, the dog reported herein experienced systemic shock and abdominal sepsis as a result of this injury, warranting aggressive emergency treatment. This case report adds to the evidence in favor of prompt surgical intervention for perineal hernia.

**References**

Fournier’s gangrene associated with chronic kidney disease in a dog

Jung-Jin Lee, Hye-Mi Park, Jung-Hyun Kim

Abstract – A dog was diagnosed with Fournier’s gangrene associated with chronic kidney disease. Clinical features included crepitant scrotal inflammation that spread to the penis; the lesion exhibited liquefactive necrosis or purulent moist gangrene. This is the first description of Fournier’s gangrene associated with chronic kidney disease in a dog.

Case description

A 9-year-old, 9.74-kg male cocker spaniel dog was presented with acute vomiting, diarrhea, and lethargy. The dog was diagnosed with chronic kidney disease with azotemia [blood urea nitrogen (BUN), 26.8 mmol/L; reference range (RR): 2.5 to 8.9 mmol/L; creatinine, 291.7 µmol/L; RR: 26.5 to 123.8 µmol/L] by the primary care veterinarian, and was treated intensively with fluid therapy for 6 d. However, the azotemia did not resolve, and the patient was referred to the Veterinary Medical Teaching Hospital of Konkuk University for further diagnostic evaluation and management.

On the day of presentation, a physical examination revealed the dog was depressed and dehydrated (approximately 5%), and unilateral cryptorchidism was detected. Thoracic auscultation was normal, and blood pressure as measured by an automated oscillometric method showed normotension (systolic blood pressure: 120 mmHg). A complete blood (cell) count (CBC) was within normal limits, while serum biochemistry showed azotemia (BUN, 41.4 mmol/L; creatinine, 309.4 µmol/L), hyperglycemia (blood glucose concentration, 8.7 mmol/L; RR: 3.9 to 6.5 mmol/L), hypercalcemia (calcium, 3.1 mmol/L; RR: 2.2 to 2.8 mmol/L), hyperphosphatemia (phosphate, 4.4 mmol/L; RR: 1.7 to 3.5 mmol/L), hyponatremia (sodium, 143 mmol/L; RR: 144 to 160 mmol/L), and hypochloremia (chloride, 104 mmol/L; RR: 109 to 122 mmol/L). The hematology and biochemistry results over time are presented in Tables 1 and 2, respectively. The urine was in an isosthenuric range (urine specific gravity, 1.010; RR: 1.008 to 1.012), and significant proteinuria (3+) was detected by the urine dipstick test, but there was no glucose, inflammatory cells, bacteria, or crystals. The urine protein to creatinine (UPC) ratio was significantly high (17.84; RR: 0.0 to 0.5); thus, glomerular disease was suspected.

Thoracic radiography revealed a mild broncho-interstitial pattern in the overall lung field, and normal cardiac size (vertebral heart score, 10.5; RR: 8.5 to 10.5). An ultrasound examination of the abdominal region showed a small amount of gallbladder sludge and a mass with suspected non-neoplastic cryptorchidism near the caudal pole of the left kidney. Although the size of the kidneys compared to the length of second lumbar vertebra was within normal range (right kidney to second lumbar ratio, 2.9; left kidney to second lumbar ratio, 2.8; RR: 2.5 to 3.5), the echogenicity of the cortex of both kidneys was increased, and there were several cysts in these areas. A hyperechoic region was noted at the corticomedullary junction of both kidneys, which was consistent with a corticomedullary rim sign.

The dog was initially administered 0.9% normal saline, 5 mL/kg body weight (BW)/h, IV, with sevelamer hydrochloride
**Table 1.** Serial complete blood cell count profiles of a dog with Fournier’s gangrene

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Day 1</th>
<th>Day 23*</th>
<th>Day 41</th>
<th>Day 64</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC (10^9 cells/L)</td>
<td>15.85</td>
<td>25.97</td>
<td>12.66</td>
<td>25.23</td>
</tr>
<tr>
<td>RBC (10^12 cells/L)</td>
<td>8.06</td>
<td>3.78</td>
<td>2.87</td>
<td>2.22</td>
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<td>Hb (g/L)</td>
<td>190</td>
<td>79</td>
<td>61</td>
<td>39</td>
</tr>
<tr>
<td>Hct (%)</td>
<td>51.48</td>
<td>24.07</td>
<td>18.45</td>
<td>13.86</td>
</tr>
<tr>
<td>MCV (fL)</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>62</td>
</tr>
<tr>
<td>MCH (pg)</td>
<td>23.6</td>
<td>20.9</td>
<td>21.3</td>
<td>17.5</td>
</tr>
<tr>
<td>MCHC (%)</td>
<td>37</td>
<td>32.8</td>
<td>33.2</td>
<td>28.0</td>
</tr>
<tr>
<td>PLT (10^9 cells/L)</td>
<td>418</td>
<td>605</td>
<td>556</td>
<td>569</td>
</tr>
</tbody>
</table>

*The day when scrotal inflammation was first observed.

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(Renvela; Sanofi-Aventis Korea, Seoul, Korea), 800 mg, PO, q24h, to inhibit phosphate absorption, kremzin (Kremzin; CJ HealthCare, Cheongju, Korea), 0.5 pouch, PO, q24h, to reduce the azotemia, and ramipril (Vasotop; Intervet Korea, Seoul, Korea), 0.125 mg/kg BW, PO, q24h, to lower glomerular reabsorption of sodium chloride. Ramipril, the UPC ratio decreased from 17.84 to 9.42. However, despite treatment, the azotemic status continued without apparent improvement.

On day 23, the dog was presented with acute depression and scrotal swelling with pain, redness, fever, and a fistula with purulent discharge (Figure 1A). The CBC revealed neutrophil leukocytosis (white blood cells, 25.97 x 10^9 cells/L; RR: 6 to 17 x 10^9 cells/L), which was attributed to the inflammation. A smear of the purulent discharge from the scrotum showed many cocci, a few macrophages, and neutrophils phagocytizing microorganisms, consistent with septic oscheitis (Figure 1B). A bacterial culture was not performed because of the client's refusal. Empirical antibiotics consisting of cephalaxin (Falexin Cap; Donghwa Pharm, Seoul, Korea), 22 mg/kg BW, PO, q12h, and enrofloxacin (Baytril; Bayer Korea, Seoul, Korea), 5 mg/kg BW, PO, q12h, were administered, and the scrotal lesion appeared to be healed in the following days. The antibiotic therapy was continued for 2 wk. On day 41, however, erythematous plaques developed in the inguinal region (Figure 2A). A microscopic view of skin scraping revealed few coccal bacteria and bottle-shaped yeasts; therefore, ketoconazole ointment was prescribed to treat the inguinal lesion. Three weeks later, on day 64, the oscheitis recurred, and the scrotal region became extremely edematous and crepitant, and had swollen to twice its normal size (Figure 2B). Upon arrival at the hospital, the dog was depressed and dehydrated (approximately 5%), and a CBC showed neutrophilic leukocytosis (white blood cells, 25.23 x 10^9 cells/L; RR: 6 to 17 x 10^9 cells/L), anemia (hematocrit, 13.9%; RR: 37 to 55%), and thrombocytosis (platelets, 569 x 10^9 cells/L; RR: 200 to 500 x 10^9 cells/L). On serum biochemistry, azotemia (BUN, 49.3 mmol/L; creatinine, 5.216 mmol/L), hypoalbuminemia (18 g/L; RR: 29 to 42 g/L), hyperphosphatemia (6.5 mmol/L), and increased aspartate aminotransferase (82 U/L; RR: 15 to 43 U/L) and alkaline phosphatase activity (158 U/L; RR: 15 to 127 U/L) were detected. Analysis of electrolytes revealed hyperkalemia (7.8 mmol/L; RR: 3.5 to 5.8 mmol/L) and hypophosphatemia (sodium, 138 mmol/L; RR: 144 to 160 mmol/L). Based on the blood analysis, acute kidney injury in addition to chronic kidney disease, secondary to a severe inflammatory process, was detected. The dog was administered 0.9% normal saline, 5.9 m/L/kg BW per hour, IV, for 6 h, with cefotaxim (Cefotaxime Sodium; Wooridul Pharm, Hwasung, Korea), 22 mg/kg BW, IV, q8h, and enrofloxacin (Baytril inj; Bayer Korea), 5 mg/kg BW, SC, q12h, to prevent septicemia, and tramadol (Tridol Inj; Yuhan, Cheongju, Korea), 4 mg/kg BW, IV, q8h, to manage pain. Three days later, on day 67, the inflammation spread from the scrotum to the penis; the penile lesion exhibited liquefactive necrosis, or moist gangrene with purulent discharge (Figure 2C). Based on the unique clinical features, a diagnosis of FG that developed as a consequence of septic oscheitis was made. Although fluids and medical treatment were administered, the dog's condition continued to deteriorate. The penile necrosis did not improve over the following days, so surgical resection of the penile and scrotal lesions was recommended. However, the owner did not consent to further examination and treatment owing to the poor prognosis, and the patient died 3 d after the diagnosis of Fournier's gangrene was made. A necropsy was not performed because of the client's refusal.

**Discussion**

Fournier's gangrene is a rare condition in veterinary medicine. There has been a single case report describing this condition in a cat (3); however, there are no known previous reports in dogs. The present report is the first to describe the clinical and laboratory findings of a case of FG that developed as a consequence of septic oscheitis in a dog with chronic kidney disease. We suggest that extended septic oscheitis in a dog with immunosuppression attributed to chronic kidney disease led to the development of FG.

Diagnosis of FG is most commonly made based on physical examination and clinical signs, including fever, and pain, erythema, and edema of the urogenital region (4,5). The application of advanced imaging techniques, such as ultrasonography,
computed tomography, or magnetic resonance imaging, allows for the detection of small pockets of fluid or gas, but false negatives may occur (1). Erythema of the skin is an early symptom of this condition, followed by edema, purulence, and crepitation. Scrotal swelling, fever, and pain are the most common symptoms of FG, and the symptoms usually persist from 2 days to over 1 wk, as shown in this case (6). Thereafter, the infection can rapidly spread to the penis and perineum (6). In this case, first the scrotal area swelled to twice its normal size; penile ulceration then developed within 3 d. This process was similar to typical features of FG as described above.

In human medicine, the major risk factors for FG are diabetes, neoplasia, hypertension, heart disease, and renal failure (7). These conditions impair host immunity so that patients become more susceptible to infection (2). In this dog with chronic kidney disease, uremic intoxication might have impaired the cellular immune response. In particular, a uremic state may be linked to a defect of the antigen presenting cells and reduced T-cell activation (8). Additionally, in the dog in this report, severe proteinuria might have resulted in the loss of immunoglobulin, which increases the risk of infection (9). These conditions may have made this dog immunocompromised and more susceptible to infection (2).

The urine protein to creatinine ratio (UPC) is the gold standard test for proteinuria, which is the hallmark of glomerular disease (10). Although renal biopsy provides definitive histopathologic evidence of glomerular disease, it is not recommended for patients with end-stage renal disease with severe azotemia, as in the present case (10,11). Because of the risk, a renal biopsy was not done, but the dog had severe proteinuria (UPC, 17.84), which was suggestive of glomerular disease. To reduce proteinuria, we administered ramipril, an angiotensin converting enzyme inhibitor (ACE-I), which is the cornerstone of antiproteinuric therapy. This class of drugs reduces efferent glomerular arteriolar resistance, resulting in lowered glomerular capillary pressure and thus reduced proteinuria. They may also prevent progressive renal injury by improving lipoprotein metabolism and inhibiting glomerular proliferation (11). In this dog, a 47% reduction in proteinuria was achieved after treatment with ramipril for 5 wk, but hypoalbuminemia persisted because the proteinuria was too severe to be normalized.

For FG in human medicine, polymicrobial infections are most commonly identified, followed by infections with Escherichia coli and Streptococcus spp., which are commensals of the urogenital and anorectal areas (1,3,7). The common sources of infections are urogenital, anorectal, and dermal (12).
Necrotizing fasciitis caused by fungi is rare, although *Candida albicans* has been reported as the primary cause of fungal infection (2). In veterinary medicine, there have been no studies identifying pathogens in FG. In the present case, although a microbial culture was not performed, the cytology of the lesions showed cocci and yeasts which were likely *Malassezia*, which are the most commonly isolated pathogens in canine infectious skin disease.

In most reports in humans, perianal, perirectal, and scrotal areas are the most common sites of infection (13). In this dog, recurrent orchitis was suspected as the source of infection.

Once bacteria invade the subcutaneous space, local tissue is destroyed by exotoxins and proteinases produced by the bacteria. Microorganisms might produce enzymes that cause coagulation of blood vessels, obliteratorative endarteritis, which reduces local blood supply and may cause ischemic necrosis of the overlying skin and underlying muscle. The resultant tissue hypoxia facilitates growth of facultative anaerobes, and then these latter microorganisms, in turn, may produce lecithinase and collagenase, leading to digestion of fascial barriers and accelerating the spread of infection (14,15).

It is rare for FG to be limited to the penis due to its rich vascular supply (16). In the present case, the penile region was also affected, and this might have been initiated by a secondary complication of a primary ischemic process, such as calciphylaxis. Recently, Yecies et al (16) reported a patient who suffered from FG resulting from calciphylaxis that likely compromised the penile vascular supply. Therefore, it is not clear if ischemia or infection was the first to occur (1). Calciphylaxis, the systemic calcification of small vessels leading to ischemic necrosis of the skin or acral gangrene of the feet, hand, or penis, is found in approximately 1% of patients with chronic renal failure (16). This calcification involves not just passive mineralization resulting from an increase in calcium-phosphorus products, but also active cellular processes in the arteriolar media muscle layer (17). In affected patients, there is an imbalance between the expression of inducers and inhibitors of calcification in the vascular smooth muscle (18). Uremia causing a severe inflammatory reaction suppresses the inhibitors of calcification (18,19). At the same time, hyperphosphatemia stimulates transformation of vascular smooth muscle cells into osteoblast-like-cells that promote calcification (19). Although biopsy and histopathologic analysis of affected lesions are needed to confirm a diagnosis of calciphylaxis, biopsy has been discouraged due to the high risks of poor healing, sepsis, and spread of necrosis (19). Because of the risks in this case, no skin biopsy was performed, but a primary ischemic process may have occurred in this case of chronic kidney disease.

In human medicine, chronic kidney disease is significantly correlated with a poor prognosis of FG. High serum creatinine and low serum bicarbonate levels, which indicate underlying chronic kidney disease, have been associated with higher mortality rates (20). Furthermore, BUN greater than 17.8 mmol/L has also been reported to have a statistically significant association with high mortality (2). In veterinary medicine, there have been no reports concerning the correlation between mortality and severity of azotemia. In this case, BUN was elevated to over 46.4 mmol/L, and the dog made poor progress.

Because of the potential for rapid decline and the progression of sepsis, prompt surgical debridement of all gangrene lesions, as well as the application of high doses of broad-spectrum antibiotics, plays a key role in the treatment of FG (14). Urgent surgical intervention might have been necessary in this case, but the patient had severe azotemia so that anesthetic could not be administered. Therefore, intravenous cefotaxim and enrofloxacine were administered. In human medicine, triple antibiotic therapy, third generation cephalosporins or aminoglycosides, and penicillin and metronidazole are typically recommended for treatment of FG (14). Combination therapy with ciprofloxacin and clindamycin is also reasonable empiric antibiotic treatment (14). In particular, clindamycin is beneficial in the treatment of necrotizing soft tissue infections because of its effects on anaerobic bacteria and its suppression of toxin and cytokine production (21). The administration of antibiotics to the patient in this case may not have been sufficient to inhibit anaerobic bacteria by classical guidelines, although antimicrobial sensitivity tests could not be performed. If early sampling of the lesions and bacterial cultures are possible when early symptoms are noted, information about antimicrobial sensitivity can be provided more promptly (3). However, regardless of adequate surgical debridement and wide spectrum antibiotic treatment, the mortality rate of FG in human medicine is high (7,22).

Apart from surgical debridement and antibiotic treatment, hyperbaric oxygen and topical therapies are also recommended. Hyperbaric oxygen increases oxygen tension in infected tissue, which inhibits the growth of anaerobic bacteria and also improves wound healing (6,23). Honey contains enzymes that digest necrotic tissues, along with phenolic acid, which has antibacterial effects. Other local treatments that have been shown to be useful are sodium hypochlorite and lyophilized collagenase (12,14).

In this study, we aimed to document the first case of FG in a dog with chronic kidney disease, a predisposing factor for FG because of immunosuppression. This patient serves as a reminder to consider this rare condition in the differential diagnosis of urogenital dermatitis. Additionally, in veterinary medicine, when chronic kidney disease is diagnosed, it is important that veterinarians confirm the presence of urogenital pain and crepitus dermis, and if needed, administer aggressive antibiotics and perform prompt surgical interventions to improve the prognosis. Furthermore, we alert veterinarians that although FG is rare, its rapid progression can be life-threatening.

**Acknowledgment**

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**References**

Is *Corynebacterium pseudotuberculosis* infection (pigeon fever) in horses an emerging disease in western Canada?

Louise E. Corbeil, Jennifer F. Morrissey, Renaud Léguillette

**Abstract** — This report describes 5 horses in the southern Alberta region with typical and atypical external abscessation due to *Corynebacterium pseudotuberculosis* (pigeon fever). “Pigeon fever” has recently been diagnosed in new geographic regions in North America and should be kept as a differential diagnosis by practitioners when an external or internal abscess is identified in a horse.

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*Corynebacterium pseudotuberculosis* is a Gram-positive, intracellular rod-shaped facultative anaerobic bacterium. It is the causative agent of caseous lymphadenitis in sheep and goats and also infects other species including horses. Equine *C. pseudotuberculosis* isolates are nitrate positive while sheep and goat isolates are nitrate negative. Infection is thought to occur through contact with contaminated soil via skin abrasions or mucous membranes and recent studies support the role of insect vectors (1). The 3 main clinical manifestations of the disease are external abscessation, internal abscessation, and ulcerative lymphangitis. External abscesses are the most prevalent and commonly develop in the pectoral muscle region, hence the name “pigeon fever.” However, external abscesses may occur in a variety of locations including deep intramuscular, axillary, inguinal, and mammary. Differential diagnosis includes other bacterial causes of suppurative myositis or internal abscessation such as *Streptococcus equi* subspecies *equi* (2). Definitive diagnosis of infection is made via culture of abscess content. Serology can be used in conjunction with bacterial culture and is most useful in cases of internal abscessation (3). Treatment of external abscesses is aimed at maturation of the abscess and establishing adequate drainage. Antibiotic treatment is indicated in cases of internal infection and ulcerative lymphangitis but it is usually avoided with external abscesses unless drainage cannot be established (2). *Corynebacterium pseudotuberculosis* infections in the United States have been reported in states not previously recognized as having endemic disease (4). This case series from southern Alberta describes cases of typical and atypical external abscessation with various treatment approaches. All 5 affected horses had no travel history to endemic areas within the United States, suggesting infection occurred from local sources and that practitioners should be aware of this potentially emerging disease in Canada.

**Case descriptions**

The blood parameters, clinical form, epidemiological and laboratory data and treatment of the horses are summarized in Table 1.

**Farm A — 2 cases**

Two horses from a herd of 16 on a farm southeast of Calgary were presented with pectoral swelling in October 2013. The first, a 6-year-old Quarter Horse gelding, had pectoral edema (Figure 1), and after 3 d of applying hot packs to the chest, a 5 cm × 3 cm abscess located 10 cm deep to the skin was lanced under ultrasound guidance. A penrose drain was placed and left in place for 2 wk and the abscess was lavaged with betadine solution. The exudate cultured positive for *C. pseudotuberculosis* and anti-*C-pseudotuberculosis* toxin antibody titers measured via synergistic hemolysin inhibition (SHI) (California Animal Health and Food Safety Laboratory, UC Davis, Davis, California, USA) was 1:2048 2 wk after initial presentation. At...
A 13-year-old Quarter Horse mare was presented for evaluation of a left-sided retropharyngeal swelling, mild inappetence, and a left-sided head tilt. The owner noticed difficulty eating and lethargy 2 wk after a routine dental examination was performed on-farm. An initial examination on-farm revealed soft tissue swelling in the left parotid area and bilateral submandibular lymph node enlargement. Oral examination was unremarkable and blood analysis revealed a mild anemia and elevated total protein (Table 1). The mare was treated on-farm with trimethoprim-sulfamethoxazole (Apo-Sulfastrim; Apotex, Kirkland, Quebec), 2.2 mg/kg BW, IM, q24h, for 8 d. The swelling failed to resolve and an ultrasound examination

**Table 1. Clinical data for 5 equine cases of Corynebacterium pseudotuberculosis infection in Alberta**

<table>
<thead>
<tr>
<th>Geographical area</th>
<th>Travel history outside Alberta</th>
<th>Clinical form</th>
<th>Hematocrit (L/L)</th>
<th>Leukocytes (× 10^9/L)</th>
<th>Total protein (g/L)</th>
<th>Fibrinogen (g/L)</th>
<th>Positive culture</th>
<th>Initial SHI titer</th>
<th>Antibiotic therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm A — East of High River</td>
<td>Travelled within AB 6 mo earlier. Closed herd for previous 1.5 mo</td>
<td>External abscess: Pectoral</td>
<td>0.28</td>
<td>13.8</td>
<td>67</td>
<td>2</td>
<td>Yes</td>
<td>1:2048</td>
<td>None</td>
</tr>
<tr>
<td>Farm A — East of High River</td>
<td>No travel. Closed herd for previous 1.5 mo</td>
<td>External abscess: Pectoral</td>
<td>0.30</td>
<td>12.8</td>
<td>69</td>
<td>2</td>
<td>Yes</td>
<td>1:2048</td>
<td>None</td>
</tr>
<tr>
<td>Farm B — Northeast of High River</td>
<td>No history of travel</td>
<td>External abscess: Parotid</td>
<td>0.29</td>
<td>7.5</td>
<td>75</td>
<td>5</td>
<td>Yes</td>
<td>1:512</td>
<td>Trimethoprim/ sulfonamide</td>
</tr>
<tr>
<td>Farm C — Northwest of Calgary</td>
<td>Brought from lower mainland of BC 15 mo earlier</td>
<td>External abscess: Mammary</td>
<td>0.28</td>
<td>9.9</td>
<td>N/A</td>
<td>N/A</td>
<td>Yes</td>
<td>1:1024</td>
<td>Cefetiofur, Enrofloxacins</td>
</tr>
<tr>
<td>Farm D — South of Calgary</td>
<td>No history of travel</td>
<td>Lymphangitis: Distal limb</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Yes</td>
<td>N/A</td>
<td>Doxycycline</td>
</tr>
</tbody>
</table>

AB — Alberta; BC — British Columbia; N/A — No results available.
Reference ranges: Hematocrit: 0.32 to 0.52 L/L; Leukocytes: 4.6 to 11.4 × 10^9/L; Neutrophils: 2.3 to 8.6 × 10^9/L; Total Protein: 57 to 70 g/L; Fibrinogen: 0.5 to 4.0 g/L. Trimethoprim sulfonamide (Apotex), Cefetiofur (Excenel), Enrofloxacins (Trutina pharmacy), Doxycycline (Trutina pharmacy).

a 5-week recheck, a small draining tract remained which was excised under ultrasound guidance. Repeat serology revealed a C. pseudotuberculosis titer of 1:4096. The tract was flushed on-farm until closure occurred and at an 8-week recheck had healed completely. Recheck antibody titer at 10 wk after presentation was 1:1024.

The second affected horse on Farm A was a 1.5-year-old Arabian gelding that had a spontaneously draining pectoral abscess which healed uneventfully in 2 wk with daily lavage with betadine solution. Culture of the abscess contents yielded a heavy growth of C. pseudotuberculosis and SHI titer (California Animal Health and Food Safety Lab) taken at presentation was 1:2048. At 5-week recheck the tract had healed completely and antibody titer was 1:512.

Screening antibody titers were measured for the remaining horses in the herd on Farm A 5 wk after the index cases presented. The titers obtained were ≤ 1:8 for 8 horses, 1:16 for 3 horses, 1:32 for 1 horse, 1:64 for 1 horse, and 1:128 for 1 horse. Four horses from Farm A, including the 6-year-old gelding (first case), had a history of travel to southern Alberta earlier that summer but did not travel to the United States.

**Farm B — 1 case**
A 13-year-old Quarter Horse mare was presented for evaluation of a left-sided retropharyngeal swelling, mild inappetence, and a left-sided head tilt. The owner noticed difficulty eating and lethargy 2 wk after a routine dental examination was performed on-farm. An initial examination on-farm revealed soft tissue swelling in the left parotid area and bilateral submandibular lymph node enlargement. Oral examination was unremarkable and blood analysis revealed a mild anemia and elevated total protein (Table 1). The mare was treated on-farm with trimethoprim-sulfamethoxazole (Apo-Sulfastrim; Apotex, Calgary, Alberta), 5 mg/kg body weight (BW), PO, q12h, and flunixin meglumine (Trutina compounding pharmacy, Ancaster, Ontario), 1.1 mg/kg BW, PO, q24h, for 5 d but clinical signs progressed. On recheck physical examination, radiographs, and endoscopy, a space-occupying soft tissue mass was diagnosed in the left gutteral pouch region. Ultrasound identified an 8-cm heterogeneous encapsulated mass axial to the parotid salivary gland. An ultrasound-guided aspirate of the mass was negative for S. equi by PCR and its culture revealed light growth of C. pseudotuberculosis. The abscess was lanced using ultrasound guidance and a Foley catheter was placed. The abscess was flushed with 0.1% betadine solution and 10 million IU of sodium penicillin was instilled after lavage. The mare was treated again with trimethoprim-sulfamethoxazole (Apo Sulfatrim; Apotex) and flunixin meglumine (Trutina compounding pharmacy, PO). An SHI titer measured on the day of discharge from hospital was 1:512. The mare was treated with trimethoprim-sulfamethoxazole for an additional 10 d on-farm and complete resolution of the abscess was noted at a 4-week recheck, at which the time antibody titer was 1:128. This horse had no history of travel to the United States. The other 2 horses in contact on-farm remained asymptomatic and titers were negative for both at 1:8.

**Farm C — 1 case**
A 4-year-old Quarter Horse reining mare living in the Calgary area was evaluated for right-sided mammary gland abscessation. In late fall of 2013 while the horse was living in the lower mainland area of British Columbia, the owner had noted a small superficial lesion on the ventral midline just cranial to the udder that burst and drained spontaneously. Right-sided mammary swelling was noted in May 2014 while living in Calgary and the mare was treated with cefetiofur sodium (Excenel; Zoetis, Kirkland, Quebec), 2.2 mg/kg BW, IM, q24h, for 8 d. The swelling failed to resolve and an ultrasound examination...
revealed diffuse subcutaneous edema and a mixed echogenic appearance of the mammary gland without any discrete fluid pockets. Culture of a spontaneously ruptured superficial abscess revealed *C. pseudotuberculosis*. A serum sample taken 3 d later had a positive SHI titer of 1:1024. The mare was treated with enrofloxacin (Trutina pharmacy), 7.5 mg/kg BW, PO, q24h, for 12 d and phenylbutazone (Vétoquinol, Lavaltrie Quebec), 1.1 mg/kg BW, PO, q12h, for 4 d and clinical signs resolved.

This horse had no history of travel to the United States. The other horses at the farm have not developed any abscesses to date.

**Farm D — 1 case**

A 14-year-old Quarter Horse gelding used for ranch work was presented with chronic diffuse swelling and superficial abscessation of the left hind limb. Six months earlier, the horse had been cast in the stall and sustained a laceration to the dorsal aspect of the left hind metatarsal region. Since then, intermittent swelling of the left hind limb had occurred with periodic breaking and draining of small abscesses. On presentation for evaluation of chronic limb swelling, the horse was sound and radiographs of the distal limb did not show significant findings. The horse was treated daily with nitrofurazone (WeCan Sales, Beamsville, Ontario) sweat bandages, and weekly with sodium iodide (Vétoquinol, Cambridge, Ontario), 30 mg/kg BW, IV, q24h, for 3 wk. Several days later another abscess spontaneously ruptured and culture of a sample from the lesion resulted in isolation of *C. pseudotuberculosis*. The horse was treated with doxycycline (Trutina pharmacy), 10 mg/kg BW, PO, q12h, for 3 wk and thereafter the leg swelling improved significantly. This horse had no travel history to the United States. The other horses at the farm had not developed any infection by the time of the writing of this report.

**Discussion**

The disease presentation observed on Farm A is comparable to that of external *C. pseudotuberculosis* infection reported in endemic areas in the southwestern United States. The most common areas for external abscesses to develop are in the pectoral region and ventral abdomen (2). Slightly less commonly affected sites include the prepuce, mammary gland, triceps, limbs, and head (2,5). A 25% occurrence of abscesses in secondary locations has been reported (6). Diagnosis of deep intramuscular abscesses in the limbs and abscesses in the axillary region can present a diagnostic challenge in horses with a history of chronic severe lameness and no external swelling (5). Less common sites for abscess formation include parotid gland (as was seen on Farm B), the neck, thorax, guttural pouches, larynx, flanks, umbilicus, tail, and rectum (2,6).

Hematologic findings in the horses in this study were comparable to those reported previously. In a retrospective study, 40% to 50% of horses with external abscesses showed either anemia of chronic disease, neutrophilia, hyperfibrinogenemia, or hyperproteinemia (6). Similar changes were found in horses with internal disease and are observed more commonly than in horses with external disease (2,6). Interestingly, we only
observed hyperfibrinogenemia in the horse from Farm B, in which abscessation occurred in the parotid gland region. This horse also had increased total protein at 79 g/L, possibly due to hyperglobulinemia from prolonged antigenic stimulation. In the 6-year-old gelding from Farm A with the deep pectoral abscessation, changes in hematologic parameters such as leukocytosis were more marked compared to those in the 1.5-year-old Arabian cross on Farm A with a more superficial, spontaneously draining abscess.

Antibody titers were measured using the synergistic hemolysis inhibition (SHI) test, which measures IgG specific for *C. pseudotuberculosis* exotoxin (2,3). While culture remains the gold standard for diagnosis, titers can be used in conjunction with clinical signs in cases in which a sample for culture cannot be obtained from an abscess or to support a diagnosis of internal infection in the absence of external abscesses (2,3). High titers alone are only indicative of exposure to *C. pseudotuberculosis*. A small proportion of horses with external abscessation can be seronegative at the time of diagnosis; therefore, titers must be interpreted in conjunction with clinical signs and hematologic changes (3,6). Titors of 1:256 or greater have been suggested as strongly indicative of active infection, either external or internal (2), which is consistent with the findings in this case series in which all horses with positive *C. pseudotuberculosis* cultures from external abscesses had titers of 1:512 or greater at the time of sampling. Screening titers of unaffected, asymptomatic horses from farms A and B with either direct or fence line contact with positive cases and draining abscesses (Farm A Case 2) ranged from < 1:8 to 1:128, which is consistent with the suggestion that titers of 1:16 to 1:128 are indicative of exposure (3). The use of antimicrobials has been shown to potentially prolong the course of disease in cases of external abscessation (2,6). Therefore, antibiotic therapy is usually reserved for cases of internal abscesses and ulcerative lymphangitis. However, horses with external abscesses showing signs of systemic illness such as fever and anorexia or horses with deep intramuscular abscesses draining through healthy tissue may benefit from antimicrobial therapy once drainage has been established (2).

Antimicrobial susceptibility testing presents a challenge for laboratories and practitioners as there are no established Clinical Laboratory Standard Institute (CLSI) guidelines for *C. pseudotuberculosis* that allow classification of isolates as susceptible or resistant (7). Since there are no CLSI minimum inhibitory concentration (MIC) breakpoints for *C. pseudotuberculosis*, the MICs recently reported for isolates tested at UC Davis can be used as a guide for therapeutic choices (7). For those cases in which a sensitivity was reported by the laboratory, CLSI guidelines for *Staphylococcus* were used. Sensitivity results were therefore not included in this report because extrapolation of sensitivity patterns across bacterial species has not been validated (7). Historically, recommended antibiotics have been trimethoprim sulfamethoxazole at 30 mg/kg BW, PO, q12h or procaine penicillin at 20 000 U/kg BW, IM, q12h for external abscesses, and rifampin at 2.5 to 5 mg/kg BW, q12h, PO in combination with ceftriaxone (2.5 to 5 mg/kg BW, q12h IV or IM) for internal abscesses (8). It should be noted that ceftriaxone alone or q24h will result in plasma concentrations less than the MICs for 50% of the time, which may explain the failure of the first ceftriaxone treatment of the horse on Farm C (7). A single dose of 6.6 mg/kg BW of ceftriaxone crystalline free acid (Excede; Zoetis) does not reach appropriate MIC concentrations of 2 μg/mL (9). A recent study found no changes in MIC susceptibility trends in samples submitted to UC Davis from 1996 to 2012 (7); however, further studies are needed to specifically test the MIC susceptibilities of those strains being isolated from horses in Canada.

The incidence of disease on Farms A and B in this study as determined by positive cultures was 13% for Farm A and 33% for Farm B. Other documented outbreaks in non-endemic areas within the US have reported a 26% mean prevalence and a range of 3% to 100% (4,10). The present study raises the question of the overall prevalence of *C. pseudotuberculosis* infection in horses in Alberta, as several practitioners in the southern Alberta area reported to us treating confirmed positive and suspect positive cases throughout the summer and fall of 2013.

Risk factors for infection from studies in endemic areas in the United States include increased contact with other horses, increased outdoor activity, summer pasture, and age, with horses 1 to 5 y old being at increased risk of infection (11). Travel history did not appear to be a contributing factor on Farms A, B, and D but was likely significant for the horse on Farm C as clinical signs were first noted by the owner before the horse was moved to Alberta. For Farm C, clinical signs were first noted while the horse was living in the lower mainland area of British Columbia, and the authors are not aware of any other confirmed positive cases originating in the lower mainland. Incubation period is variable and reported as 3 to 4 wk (12), and survival of bacteria can be up to 8 mo in manure contaminated soil at 37°C (13). Under experimental conditions, increased survival of the bacteria in soil at lower temperatures (4°C compared to 37°C) has been observed (14); however, the effect of below freezing winter temperatures on the potential for disease in future years in Alberta is unknown. Most horses are reported to have a single lifetime episode; however, recurrence or persistence of infection for greater than 1 year can occur in some individuals (6). Recurrent abscessation at the same site is reported in the literature, often with less than a few wk between apparent abscess resolution (6). Horses with recurrent or persistent infections may act as a source of environmental contamination or infection of naïve horses in southern Alberta and other Canadian provinces in the years ahead. Movement of affected horses between western provinces, across Canada to eastern provinces, and to and from endemic areas in the United States may contribute to emergence of disease in new areas. In addition, changes in environmental conditions and their effect on insect vectors may play a role in disease emergence. Insect vectors such as *Haematobia irritans* (horn fly), *Stomoxys calcitrans* (stable fly), and *Musca domestica* (house fly) have been implicated as potential mechanical vectors for disease (1). Insect vectors may have played a role in disease transmission in the cases discussed, especially in Farm B where no horses had travelled to or from the property for 1.5 y. In the United States, the geographic distribution of disease has changed significantly in the past 10 y. Sporadic epidemic outbreaks from 2002 to 2007 have been documented in areas with
a historically low prevalence of disease such as Colorado, New Mexico, Wyoming, Utah, Oregon and Idaho (10,15). Endemic areas such as California and Texas, which usually have a disease prevalence of 5% to 10%, have seen clusters of disease outbreaks and an increase in prevalence of disease (15,16). A recent study documenting frequency of *C. pseudotuberculosis* infection in horses across the United States over a 10-year period reported a significant increase in proportion of culture positive samples submitted during 2011 to 2012 and noted positive samples from horses in states not previously recognized as having endemic disease (4). Disease outbreaks in Canada have also emerged in recent years. In 2010, a large outbreak in the Okanagan Valley involving at least 35 symptomatic horses was described in a survey conducted by the British Columbia Ministry of Agriculture (17). Genetic analysis of isolates from Alberta and British Columbia would be useful in shedding further light on epidemiology.

Historically, outbreaks in non-endemic areas in the US were usually preceded by high environmental temperatures and drought conditions (15). Cases are seen year round in endemic areas; however, a peak seasonal incidence is reliably seen in the dry months of late summer and fall in the Southwestern USA (2,15). Definitive environmental factors supporting the spread of infection are yet to be determined (2). Extreme rainfall and flooding occurred in southern Alberta June of 2013, with some areas recording over 300 mm of rainfall within 48 h (18). This is in contrast to what is reported in the US where historically, outbreaks in non-endemic areas were usually preceded by high environmental temperatures and drought (15). Recently, an epidemiologic study of an outbreak in Kansas in 2012 reported that infections occurred in areas that received relatively higher amounts of precipitation but followed a warm winter and hot dry summer season (19). The authors of this investigation speculated that some of the infections originate locally from *C. pseudotuberculosis* present in soil and/or other hosts (19). Heavy rainfall may have precipitated an increase in fly populations and influenced soil microflora, contributing to disease emergence in southern Alberta in 2013.

The 5 farms described in this study were not near one another and infection arising through local changes in soil bacterial populations seems likely.

Present recommendations for disease prevention and control include implementing insect control measures, efficient manure removal, minimizing environmental contamination with purulent exudates, and proper disposal of contaminated bedding (2,11,13). There is no equine vaccine available. A licensed vaccine exists for sheep, but its safety and efficacy have not been evaluated in horses (2,20). A 2010 pilot study in mice was conducted with an equine bacterin toxoid in which vaccinated mice demonstrated significant protection from challenge infection (21).

The cases described in this report show various clinical presentations and raise the question of prevalence of *C. pseudotuberculosis* in Alberta. The role of climate changes as they relate to disease prevalence and to the survival of potential insect vectors is yet to be fully described, and continued monitoring and epidemiologic investigations are warranted.

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References

Case Report  Rapport de cas

Acute myeloid leukemia with basophilic differentiation in a 3-year-old Standardbred gelding

Mary Catherine Furness, Emile Setlakwe, John Sallaway, Darren Wood, Jordan Fromstein, Luis G. Arroyo

Abstract — A 3-year-old Standardbred gelding with a history of pyrexia, persistent hemorrhage from the oral cavity, and a large, soft swelling at the junction of the caudal aspect of the mandibular rami and proximal neck was evaluated. The horse had neutropenia and anemia, with atypical granulated cells in a blood smear. Additional tests confirmed acute myeloid leukemia with basophilic differentiation, which has been reported in humans, cats, dogs, and cattle but not horses.

Résumé — Leucémie myéloïde aiguë avec différenciation basophile chez un hongre Standardbred âgé de 3 ans. Nous avons évalué un hongre Standardbred âgé de 3 ans avec une anamnèse de pyrexie, d’hémorragie persistante de la cavité orale et d’une grosse enflure molle à la jonction de l’aspect caudal des rameaux mandibulaires et du cou proximal. Le cheval souffrait de neutropénie et d’anémie avec des cellules granulées au frottis sanguin. Des tests additionnels ont confirmé une leucémie myéloïde avec différenciation basophile, qui avait déjà été signalée chez les humains, les chats, les chiens et le bétail, mais pas chez les chevaux.

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Case description

A 3-year-old Standardbred gelding (trotter) was presented to the Ontario Veterinary College — Health Sciences Centre for evaluation of a large swelling under the mandibular rami and proximal neck, pyrexia, anemia, and anorexia. The horse had been castrated approximately 30 d earlier with no complications reported. He was lightly exercised for 7 d following the procedure; however, this was discontinued when the horse became lethargic. Twelve days prior to presentation, mild bleeding from the oral cavity was noted and was attributed to retained deciduous teeth. The teeth were removed but the hemorrhage continued. Two days prior to presentation, the horse became pyrexic and developed a large fluctuant swelling at the junction of the caudal aspect of the mandibular rami and proximal neck. On the day of presentation, the owners noted that the gelding’s abdomen appeared distended.

On physical examination, the horse was quiet but responsive to his environment. There was active but mild hemorrhage from the oral cavity as well as venipuncture sites from previous medication administered by the referring veterinarian. Those treatments included sodium penicillin (Novapharm, Toronto, Ontario), gentamicin (Merck Animal Health, Kirkland, Quebec), and flunixin meglumine (Pfizer Animal Health, Kirkland, Quebec). The horse was tachycardic [68 to 80 beats/min (bpm)] with a regular rhythm and a strong pulse quality. The respiratory rate and effort were within normal limits and although lung sounds were detected on both sides, no crackles or wheezes, or nasal discharge was noted. The rectal temperature was mildly elevated at 38.6°C [reference interval (RI): 37.0°C to 38.0°C]. Gastrointestinal sounds were present and there was moderate to marked abdominal distension. There were no petechial or ecchymotic hemorrhages on the oral mucous membranes and no obvious trauma to the upper or lower incisors, mucous membranes, or tongue. There was mild swelling of the left hind tendon sheath and distension of both radiocarpal joints. No heat was detected in any joint and the horse ambulated around the stall with ease. A plaque of ventral edema was noted, extending from the pectoral region down through the elbows distally and caudal towards the prepuce. Blood was collected from the left cephalic vein using a 22-gauge needle and placed into vacutainer tubes containing EDTA and citrate. The samples were submitted for complete blood (cell) count (CBC) and serum biochemistry profile, as well as coagulation assays including pro-thrombin time (PT), partial thromboplastin time (PTT), thromboelastography (TEG), plasma fibrinogen.
concentration, and D-dimer concentration. Urine was collected for complete urinalysis.

The CBC revealed a moderate leukopenia (2.7 × 10⁹ cells/L, RI: 5.1 to 11.0 × 10⁹ cells/L), decreased hemoglobin concentration (107 g/L, RI: 112 to 169 g/L), decreased hematocrit (0.31 L/L, RI: 0.38 to 0.55 L/L), and severe neutropenia (0.86 × 10⁹ cells/L, RI: 2.8 to 7.7 × 10⁹ cells/L). The red cell indices were within reported reference intervals. The PT and PTT were both greater than 100 s (RI: 10.1 to 13.2 s and 35.8 to 49.2 s, respectively). The platelet count was within the reference interval, while the plasma fibrinogen concentration was markedly decreased (0.4 g/L, RI: 1.2 to 2.3 g/L). The thromboelastography failed to produce a clot within the test period, indicating hypoagulability. The D-dimer concentration was markedly elevated at 6.8 μg/mL (control value: 0.33 μg/mL). The urinalysis was unremarkable. The serum biochemistry profile revealed moderate hypoalbuminemia (18 g/L, RI: 30 to 37 g/L), hyperglobulinenia (42 g/L, RI: 26 to 41 g/L), an altered albumin to globulin (A:G) ratio (0.43, RI: 0.8 to 1.3), and elevated serum amyloid A (270 mg/L, RI: 0 to 19 mg/L).

Based upon the clinical examination and laboratory data, differential diagnoses for multiple-site hemorrhage included vitamin K antagonism via rodenticide toxicity or ingestion of dicoumarol (moldy sweet clover), immune-mediated destruction of clotting factors, idiosyncratic drug reaction, and disseminated intravascular coagulation related to sepsis or neoplasia.

A thoracic ultrasound examination (ALT ultrasound and Curve Array C52 probe Model HDI 3000; Bothell, Washington, USA) revealed only a very mild visceral pleural roughening on both the right and left thorax. An abdominal ultrasound was unremarkable except for a moderate to marked amount of free fluid. An ultrasound examination of the mass at the caudal aspect of the mandibular rami revealed flocculent material with a honeycomb appearance.

An abdominocentesis was performed and the mass at the mandibular rami was aspirated. Cytological analysis confirmed the presence of hemoabdomen and hematoma, respectively. The aspiration sites bled at a rate of 1 to 2 drops/s. The rate of hemorrhage had significantly slowed from the abdominocentesis site and had subsided from the mass caudal to the mandibular rami, oral cavity, and venipuncture sites by day 3 in the hospital. However, the packed cell volume had decreased to 0.09 L/L, necessitating a 5 L whole blood transfusion. The vitamin K1 administration was modified to 0.5 mg/kg BW, IM, q12h. The corticosteroid and antibiotic therapy was discontinued.

Repeat CBC performed on day 4 of hospitalization revealed an improvement in the white blood cell count (4.3 × 10⁹ cells/L, RI: 5.1 to 11.0 × 10⁹ cells/L) but persistent non-toxic neutropenia (0.77 × 10⁹ cells/L, RI: 2.8 to 7.7 × 10⁹ cells/L), moderate anemia (RBC 4.1 × 10¹² cells/L, RI: 6.9 to 10.7 × 10¹² cells/L; hemoglobin 64 g/L, RI: 112 to 169 g/L; hematocrit 0.19 L/L, RI: 0.38 to 0.55 L/L), an increase in red cell distribution width (21.2%, RI: 16.3% to 20.4%) suggestive of erythrocyte regeneration, and hypoproteinemia (56 g/L, RI: 57 to 75 g/L). Other red cell indices and the platelet count remained within reference limits. The manual differential blood cell examination revealed occasional non-segmented leukocytes with basophilic cytoplasmic granules. The serum biochemistry profile variables had also improved except for mild hyponatremia (133 mmol/L, RI: 136 to 144 mmol/L), increased glutamate dehydrogenase (GLDH) activity (16 U/L, RI: 1 to 7 U/L), and a consistently elevated serum amyloid A (250.6 mg/L, RI: 0 to 19 mg/L).

An anticoagulant screen for brodifacoum, bromadiolone, chlorophacinone, diphacinone, pindone and warfarin using high performance liquid chromatography was negative.

A bone marrow aspirate and core biopsy were collected from the right tibial coxae using a bone marrow biopsy needle (Kendall Monoject Bone marrow Biopsy needle, 11Gx4; Tycohealthcare Group, Mansfield, Massachusetts, USA) due to the presence of abnormal leukocytes and the persistent cytopenias. The bone marrow aspirate was poorly cellular and the predominant cell was a population of atypical round cells that contained few to many basophilic granules. These cells were large with pale basophilic cytoplasm, moderate nucleocytoplasmic ratio, and round nuclei occasionally with a single prominent nucleolus (Figure 1). Limited differentiation was present, as occasional cells with indented or segmented nuclei contained similar granules. Other cell lines were minimally represented, although a few erythroid precursors were noted. Toluidine blue staining of additional aspirate slides confirmed metachromatric granules typical of either mast cells or basophils. Cells of...
myeloid lineage with basophilic differentiation were suspected based upon nuclear morphology and paucity of metachromatic granules (Figure 1). These findings were interpreted as acute myeloid leukemia with basophilic differentiation. Due to the guarded prognosis for survival, the gelding was euthanized with an intravenous overdose of pentobarbital (Merck Animal Health).

A postmortem examination revealed ecchymotic and petechial hemorrhages affecting the heart, lungs, and abdominal cavity. Subcutaneous edema was present along the ventral abdomen and forelimbs as well as within the mesenteric fat and wall of the urinary bladder. There was 5 L of serous fluid within the peritoneal cavity and approximately 250 mL of serous fluid within the pericardial sac.

The bone marrow grossly appeared approximately 80% active with 20% fat. Histologically, cellularity of the marrow was > 95%. Approximately 70% of the cells were large, undifferentiated blast cells or myeloid precursors with eosinophilic cytoplasm, large, central round nuclei with occasional clefting and finely stippled chromatin (Figure 2). Approximately 10% to 15% of these cells had distinct intracytoplasmic granules when stained with toluidine blue. The myeloid to erythroid ratio was 30:1. Similar cells were found in the liver and lymph nodes. Immunohistochemical staining showed that both CD3+ T lymphocytes and CD20+ B lymphocytes were scattered throughout the sections, but the neoplastic cells were negative for both stains, ruling out lymphoid origin of the cells. Specific immunohistochemical identification of the cells as myeloid in origin could not be performed due to the lack of equine antibody markers. The final diagnosis was acute myeloid leukemia and diffuse coagulopathy.

**Discussion**

A rare acute myeloid leukemia with an unusual manifestation of disseminated intravascular coagulation (DIC) in a 3-year-old Standardbred gelding is described. Myeloproliferative disorders have been infrequently reported in the horse (1) and have included chronic granulocytic leukemia (2), monocytic leukemia (3), myelomonocytic leukemia (4), and eosinophilic myeloproliferative disorders (5).

The unexplained bleeding from the oral cavity and hemotoma of the throat latch region prompted referral of this case. In horses, hemorrhage can occur as a result of trauma, thrombocytopenia due to immune-mediated destruction (6), chronic liver failure (7), deficient or defective coagulation factors (8,9), vitamin K consumptive coagulopathies including rodenticide intoxication (10), and moldy sweet clover poisoning (11), and DIC secondary to sepsis and neoplasia (6,12). In the present case, the uncontrollable hemorrhage was likely associated with uncompensated DIC, as indicated by the prolonged PT and aPTT, decreased fibrinogen concentration, increased D-dimers, and the failure of the blood sample to clot using thromboelastography (TEG).

In humans, DIC is a well-documented complication in patients with hematopoietic malignancies (13) and has been associated with altered platelet function (14,15), increased cell membrane expression of tissue factor (16), neoplasm associated procoagulant and prothrombotic agents (16), and decreased circulation of anti-coagulant factors (16–18). In some patients with hematopoietic malignancies, initial hypercoagulability causes platelet and coagulation factor consumption (13,16). Enhanced fibrin deposition results in up-regulation of the fibrinolytic system (13). Since there is no single diagnostic test to confirm DIC, the clinical findings and results of various coagulation assays (including PT, APTT, fibrinogen concentration, platelet count, fibrin degradation products and/or D-dimers) are used to support the diagnosis (19). A scoring system developed for use in human medicine takes into account the findings of specific coagulation assays for the diagnosis of overt and non-overt DIC, and has been utilized in patients with hematologic malignancies (19,20). This score incorporates the results of platelet count, the concentration of fibrin degradation products, prothrombin

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**Figure 1.** Wright’s stained bone marrow aspirate collected from the right tuber coxae showing erythroid and megakaryocytic hypoplasia and numerous blast cells of myeloid origin demonstrating basophilic differentiation. Image magnification 1000×.

**Figure 2.** Hematoxylin and eosin stained section of bone marrow collected at necropsy exhibiting marked hypercellularity and predominance of large myeloblasts (arrows) resulting in increased myeloid to erythroid (M:E) ratio. Numerous mitotic figures were noted (asterisks). The interpretation was acute myeloid leukemia. Image magnification 600×.
time, and activity of antithrombin and protein C and elevated thrombin-anti-thrombin (TAT) complexes as indicators of the presence of DIC (20). A similar validated scoring system does not exist for horses.

Interestingly, the platelet count in this horse was within our laboratory’s reference interval and remained so throughout the duration of hospitalization. No assessment of platelet function was attempted; there was no evidence of excessive removal or consumption based upon consecutive platelet counts. However, the coagulation assays confirmed a profound deficiency of activity of the coagulation factors of both the intrinsic and extrinsic pathways. The TEG, which measures the coagulation process from initial clot formation to activation of the coagulation factors (21) failed to develop any clot within the allotted time. TEG analysis for coagulation has been evaluated in healthy Thoroughbred horses (22), in foals (23), and critically ill adult horses (24). However, TEG analysis has not been reported and validated as a means to support the diagnosis of DIC in horses. Both the PT and APTT were significantly prolonged, indicative of ineffective or insufficient function and activation of the extrinsic and intrinsic coagulation pathways, consistent with the TEG result. Activation of the fibrinolytic system was documented by the markedly elevated D-dimer concentration, which has been associated with poor prognosis and non-survival in horses with colic (25).

In humans, coagulopathy associated with acute promyelocytic leukemia is a defining characteristic of the disease, and patients will often present with signs of DIC prior to diagnosis of the primary condition (26). The coagulopathy is a syndrome of hypercoagulability, DIC, fibrinolysis, and proteolysis causing hemorrhage and thrombosis (26). Thrombocytopenia is often noted and is partially attributed to myelophthisis (26). The leukemic cells express factors which contribute to the development of bleeding, including increased expression of annexin II, enhanced cytokine production, increased proteolysis, and the creation and activation of microparticles (26). Microparticles are cell-derived membrane fragments measuring 0.1 to 1.0 μm, originating from normal cells, such as platelets, blood cells, and endothelial cells, or malignant cells. Microparticles are involved directly and indirectly in activating coagulation and has been associated with reduced survival and higher rates of venous thromboembolism in patients with metastatic breast and pancreatic cancer (26). The presence of microparticles was not evident in this horse, but wasn’t investigated further.

Similar to the presentation frequently observed in humans, the patient was presented with evidence of a bleeding disorder and a diagnosis of DIC was supported by the analysis of various coagulation assays. Thrombocytopenia was not a feature of the syndrome in this horse; however, platelet function was not evaluated and therefore the functionality of the platelets may have been less than optimal.

Successful resolution of DIC is dependent on the identification and aggressive treatment of the initiating disease process (6). In this particular case, the inciting cause was not initially apparent, therefore supportive therapy with vitamin K administration to support the function of the vitamin K-dependent clotting factors as well as 2 plasma transfusions to provide coagulation factor proteins was administered. This treatment appeared to result in minor clinical improvement in hemostatic function and general demeanor. However, the effects were short-lived and ultimately overwhelmed by the primary condition.

The clinical presentation of myeloproliferative disorders in horses is generally non-specific with intermittent episodes of pyrexia, anorexia, and lethargy (1). Lethargy and exercise intolerance were the first clinical signs observed in this case and were followed by undulating pyrexia. Evidence of involvement of the hematopoietic system was first observed following the development of the fluctuant swelling at the caudal aspect of the mandibular rami, likely following self-trauma, and marked anemia. The first possible indication of a leukemic process was observed in the peripheral blood 4 d following admission when occasional non-segmented leukocytes with basophilic cytoplasmic granules were noted, suggestive of basophilic myelocytes. The bone marrow aspirate revealed megakaryocyte and erythroid hypoplasia as well as myeloid hyperplasia, although the immaturity of the cells made it difficult to differentiate them from cells of lymphoid origin. The definitive diagnosis of acute myeloid leukemia was made upon postmortem examination in which ~70% of the cells in the bone marrow were large undifferentiated blast cells which had toluidine blue positive granules and were negative for lymphocyte markers.

Basophilic leukemias have been reported infrequently in the veterinary literature, and may occur as a myeloproliferative neoplasm or as an acute process (27). Both develop from the neoplastic transformation of multipotent bone marrow stem cells and are further subdivided into granulocytic and monocytic leukemias (27). Basophilic leukemias have been reported in dogs (28,29), cats (30,31), and a calf (32), but we are unaware of reports of any in horses.

Acute basophilic leukemia is a rare form of acute myeloid leukemia (33,34). It is diagnosed based on cellular morphology, metachromasia with toluidine blue staining, electron microscopy (34,35), and flow cytometric analysis (35), although it is difficult to differentiate from other similar myeloid leukemias (34). Peripheral basophilia may or may not be present, similar to the initial presentation of the case reported here (34); however, blast cells with variable metachromatic granules compose a significant proportion of cells in bone marrow aspirates (34) or core biopsy (33). Diagnosis in this case was based upon cellular morphology and by the presence of toluidine blue positive granules in tumor cells. Toluidine blue positive granules are not present in cells of lymphocytic or monocytic origin. Other specific diagnostic modalities including flow cytometry and cytogenetic studies were not performed due to lack of availability of equine specific reagents.

Treatment with chemotherapeutic agents such as hydroxyurea has been reported in the human and canine literature; however, chemotherapy was not attempted in this case (36) due to overt signs of DIC, poor prognosis for survival, and costs associated with hospitalization and critical care.

References
Case Report  
Rapport de cas

Mesenteric thrombus associated with pulmonary, splenic, portal, and caval thrombi in a dog that was presented for an acute abdomen

Adam Joseph Rudinsky, Valerie Jill Parker, Julien Guillaumin

Abstract — A 6-year-old Labrador retriever dog was presented for acute abdominal pain. A tentative diagnosis of mesenteric thrombosis was established antemortem. The dog was treated with supportive care and anti-coagulation but was ultimately euthanized due to disease-related complications. Necropsy examination confirmed an acute mesenteric thrombus along with widespread thromboembolic disease. Potential causes were protein-losing nephropathy, hepatopathy, and/or corticosteroid administration.


Later that day the dog was found sternally recumbent, lethargic, and surrounded by multiple piles of bilious vomitus. The dog resided in a controlled environment; therefore, ingestion of toxins or foreign material was considered unlikely. At presentation, the dog was being treated for flea allergy dermatitis and pyotraumatic dermatitis with anti-inflammatory doses of prednisone, topical and oral antibiotics (type and dose unknown). The dog was polyuric and polydipsic after starting the medications but no other adverse side effects of the previous diagnoses or treatments were reported. There were no other concurrent medications, illnesses, or pertinent history.

Physical examination revealed a quiet, alert, responsive attitude, elevated body temperature (39.5°C), tachycardia (200 beats/min), and mild dehydration based on tacky mucous membranes. Moderate abdominal distention with severe pain and a ballotted fluid wave on palpation were also noted. Dermatologic lesions appeared to be resolved and the remainder of the physical examination was unremarkable.

Emergency diagnostics included a packed cell volume/total protein (PCV/TP) (62%; 56 g/L), Doppler blood pressure (130 mmHg), pulse oximetry (94%, room air), blood gas (NOVA Critical Care Express; NOVA Biomedical, Waltham, Massachusetts, USA) with electrolytes (mixed respiratory alkalosis and metabolic acidosis) (Table 1), and tri-cavitary ultrasound fluid assessment, which revealed moderate to marked peritoneal effusion. Abdominocentesis yielded a serosanguinous, transudate fluid with undetectable protein on refractometer. A paired serum and peritoneal fluid lactate (NOVA Critical Care Express) and glucose (AlphaTrak 2 Glucometer; Abbott Laboratories, Chicago, Illinois, USA) (Table 1) were obtained and used to rule out septic peritonitis (5).
Table 1. Pertinent laboratory findings: Clinically significant findings from blood gas, electrolyte, biochemical and peritoneal fluid analyses

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
<th>Reference range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venous electrolytes and blood gas panel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>7.44</td>
<td>7.38 to 7.48</td>
</tr>
<tr>
<td>pCO₂</td>
<td>3.56 kPa</td>
<td>3.73 to 6.53</td>
</tr>
<tr>
<td>pO₂</td>
<td>6.7 kPa</td>
<td>3.33 to 6.12</td>
</tr>
<tr>
<td>Sodium</td>
<td>139 mmol/L</td>
<td>143 to 150</td>
</tr>
<tr>
<td>Potassium</td>
<td>3.8 mmol/L</td>
<td>3.5 to 4.8</td>
</tr>
<tr>
<td>iCalcium</td>
<td>1.09 mmol/L</td>
<td>1.22 to 1.42</td>
</tr>
<tr>
<td>iMagnesium</td>
<td>0.35 mmol/L</td>
<td>0.46 to 0.65</td>
</tr>
<tr>
<td>Chloride</td>
<td>116 mmol/L</td>
<td>111 to 119</td>
</tr>
<tr>
<td>HCO₃</td>
<td>18.4 mmol/L</td>
<td>16.9 to 24.2</td>
</tr>
<tr>
<td>Serum values</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactate</td>
<td>2.3 mmol/L</td>
<td>0.5 to 3.5</td>
</tr>
<tr>
<td>Glucose</td>
<td>9.76 mmol/L</td>
<td>4.22 to 6.99</td>
</tr>
<tr>
<td>Albumin</td>
<td>15 g/L</td>
<td>29 to 44</td>
</tr>
<tr>
<td>Peritoneal fluid values</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactate</td>
<td>1.3 mmol/L</td>
<td>0.5 to 3.5</td>
</tr>
<tr>
<td>Glucose</td>
<td>5.32 mmol/L</td>
<td>4.22 to 6.99</td>
</tr>
</tbody>
</table>

Second tier diagnostics included a complete blood (cell) count (CBC), biochemistry profile, urinalysis and urine culture, prothrombin time (PT), activated partial thromboplastin time (aPTT), D-dimers concentration, and thoracic and abdominal radiographs. The CBC revealed decreased plasma protein [46 g/L, reference interval (RI): 57 to 72], elevated hematocrit (58%, RI: 37 to 56%), mild thrombocytopenia, a total leukocytosis characterized by a mature neutrophilia and interpreted with the remaining leukogram as a stress response. Hypoalbuminemia was the sole pertinent finding on the biochemistry profile (Table 1). Urinalysis revealed significant proteinuria (3+) and occasional coarsely granular casts. The urine-protein:creatinine ratio was elevated (6.5, RI: < 0.5). The urine culture revealed no bacterial growth. The aPTT was 25% prolonged compared to control; PT was within normal limits. The D-dimers were elevated (2 to 4 µg/mL, RI: < 0.25 µg/mL). Thoracic radiographs were unremarkable. Abdominal radiographs revealed loss of serosal detail, microhepatia, and several loops of small intestines that contained gas and were approaching the upper limit of size based on comparison to vertebral body height of L5 (6). Final abdominal radiographic diagnoses were small intestinal function ileus or mechanical obstruction, peritoneal effusion, partially occlusive splenic vein thrombus and suspected portal vein thrombus.

Once stabilized, the animal’s clinical status remained unchanged throughout the first 24 h of hospitalization. However, the animal suffered an acute worsening in neurologic status characterized by profound ataxia, asymmetric neurologic deficits, and mentation changes. At that time the owners elected to euthanize and a complete necropsy was requested.

Grossly at necropsy, the peritoneal cavity contained a marked volume of yellow-red, clear fluid. A 30-cm segment of the jejunal was dark red with moderately demarcated edges. A mesenteric vein supplying this segment was thickened and distended with an, acute, red, gelatinous thrombus. Additionally, chronic thrombi were identified in the splenic vein near the hilus, the main portal vein, immediately distal to the gastroduodenal and splenic veins, and in the caudal vena cava. Multiple, small portocaval and portorenal shunts were noted.

Histopathologic evaluation of tissues revealed diffuse, moderate pulmonary edema and a focal pulmonary arteriolar thrombus. The kidney had multi-focal, moderate glomerular basement membrane mineralization and the renal tubular lumens contained mild to moderate amounts of protein. The spleen contained several multifocal, subacute, thrombi. The duodenum, small intestine and colon all exhibited multifocal, marked mucosal coagulation necrosis.

The liver showed bridging portal fibrosis, hemosiderosis, centrilobular hepatocellular vacuolization (lipid), and nodular hyperplasia. The portal vein contained a chronic thrombus and cystic medial necrosis (degenerative vascular disease). The vena cava contained a segmental, chronic thrombus.
The final pathologic diagnoses included diffuse marked peritoneal effusion, and segmental, severe acute mesenteric thrombus with hemorrhage. Based on the appearance of the various reported thrombi as well as the acquired portocaval and portorenal shunts, it was concluded that the portal vein and caudal vena cava thrombi were more chronic and that the splenic thrombi were chronic or subacute. Pulmonary thromboembolism and diffuse mild interstitial nephritis were also identified.

Discussion
This is the first report of a dog presented with an acute abdominal syndrome with a clinical, pre-histopathological diagnosis of mesenteric thrombus, and ultimately complicated with pulmonary, splenic, portal, and caudal vena cava thrombi. Based on the clinical presentation and the appearance of the various thrombi on necropsy, we propose that in this animal, the acute thrombosis of the mesenteric vein resulted in inadequate time for collateral circulation and subsequent infarction of the bowel, contributing to the acute abdomen presentation.

There are only 2 cases of mesenteric thrombosis reported in dogs (1,7). All previous diagnoses of mesenteric thrombosis in dogs were based on histopathologic identification. In 1998, Shahar et al (1) described a 4-year-old Cocker spaniel that underwent exploratory laparotomy for a suspected intussusception and was treated successfully with intestinal resection and anastomosis. Mesenteric thrombus was diagnosed on histopathology. No apparent cause for thrombus formation was found in that dog. In a retrospective case series on canine portal vein thrombosis, mesenteric thrombus was found in 3 dogs at necropsy. No specific data were available on those 3 dogs (7).

In human patients, onset of signs range from peracute to chronic. Non-specific clinical signs including inappetence, vomiting, and abdominal pain predominate (8–10). In the case report, clinical signs were manifested as an acute abdomen. This is the most notable distinction between the previous cases and the dog described here; Shahar et al (1) reported a dog with a 48-hour history of clinical signs, whereas the dog described herein presented acutely.

Diagnosis of mesenteric vein thrombosis relies on exclusion of other causes of acute abdomen. Basic laboratory tests are unlikely to assist in diagnosis; however, thrombocytosis may be an important finding in some humans with mesenteric vein thrombosis, while hypoxia and lactic acidosis have been found to be negative prognostic indicators in humans (9–10). In the present case, abdominal fluid analysis, D-dimers, and clinical presentation were fundamental to raising the clinical suspicion for thrombosis.

As in the case reported here, abdominal imaging is vital to diagnosis. In humans, radiographs are abnormal in the majority of patients, although the findings tend to be nonspecific (3). The gold standard for imaging diagnosis in humans is computed tomography with angiography. This modality is stated to have an overall accuracy of approximately 90% (4,8,11). Abdominal ultrasound is limited in its ability to recognize and investigate smaller vasculature. Findings during ultrasonographic imaging, similar to this case, often are nonspecific. Scintigraphy, angiography, and magnetic resonance imaging have also been reported in diagnosis of this condition, with varying degrees of success (10,12). Advanced imaging is variable in its availability in veterinary clinics and may be unsuitable for critical patients, limiting its utility.

In humans, management of portal hypertension and aggressive anticoagulation are first line strategies and treatments for mesenteric vein thrombosis, with surgery and bowel resection reserved for complicated cases of major intestinal injury and perforation, and interventional radiology and thrombolitics reserved for specific cases (10,12). Surgery has previously been shown to result in a positive outcome in 1 dog as a treatment for mesenteric thrombosis by Shahar et al (1); however, the dog described in this report developed significant complications and was subsequently euthanized prior to further intervention.

Medical management targets pain control, support measures, and anti-coagulation in the acute phase. Human patients are typically treated with broad-spectrum antibiotics due to potential risk for bacterial translocation. Anti-coagulation is the standard of care in the acute phase in human medicine (8–9,13). We chose low dose heparin in the initial stages of management. At the time of diagnosis, this was done to achieve anti-coagulation with flexibility to allow invasive procedures if necessary due to the half-life of the drug. Low-dose heparin, specifically 100 U/kg BW, SQ, q12h, has been shown in various canine models of septic peritonitis to improve survival and decrease intra-abdominal abscesses and adhesions (14,15). However, doses between 200 and 300 U/kg BW, SQ, q8h are usually considered more appropriate in normal dogs in order to achieve therapeutic anticoagulation (16–19). Therefore, it is possible that the patient could have benefited from a higher dose of heparin, given the prothrombotic state. As this patient was suspected of having an acute thrombosis, any lack of appropriate anticoagulation may have lead to progression of thrombosis. Lastly, multimodal pain management was initiated with supportive care measures.

In the chronic stages, therapy is aimed at long-term anticoagulation often in excess of 6 months as well as treatment of any identified predisposing causes. This is often done utilizing anti-coagulants in favor of anti-platelet drugs. Anti-coagulant therapy is associated with reduced hospitalization, mortality, and need for surgery in humans (20). The chronic stage was not reached in this animal; however, studies in humans have shown that the presence of other thrombi result in a decreased likelihood of success being achieved with medical management alone (21).

Reports of thrombi in the mesenteric veins describe variable prognoses. In humans, prognosis with acute mesenteric venous thrombosis has improved drastically with advanced imaging and early diagnosis (4,13,22). Short-term mortality is most commonly linked to complications including sepsis, infarction, persistent and recurrent thromboembolic disease. Long-term prognosis is highly dependent on correct identification and treatment of underlying conditions.

Thromboembolic disease is a major contributor to morbidity and mortality associated with disease processes resulting from hypercoagulability, blood stasis, and/or endothelial injury. The most commonly implicated disease processes include immune-mediated diseases, protein-losing enteropathy, protein-losing...
nephropathy (PLN), neoplasia, cardiac disease, sepsis, and iatrogenic causes (7,23–24). The case described here had 3 primary reasons for thrombus formation: PLN, liver disease, and iatrogenic administration of corticosteroids. This likely resulted in a multifactorial prothrombotic state, which affected the animal.

On postmortem examination, one disease process was not identified as the primary risk factor for thrombus formation. Overall, changes to the kidneys were mild. Protein loss was observed within the renal tubules but the changes to Bowman’s capsule and glomeruli were minimal to absent, respectively. The liver exhibited evidence of bridging fibrosis and nodular hyperplasia but was otherwise histopathologically unremarkable. There was no evidence of neoplasia, infectious disease, or active necroinflammatory disease in the liver.

Antemortem, PLN was considered the greatest risk factor for hypercoagulability (23,24). This assessment was based on quantification of significant protein loss in the urine. Diagnostic imaging and urine culture decreased suspicion for alternative causes of proteinuria. In 1 study, approximately 25% of dogs with PLN experienced thromboembolic complications (25). Although renal loss of antithrombin has received much attention in the pathophysiology of this disease process, it is likely multifactorial in nature (26,27). Alternatively, primary liver disease could not be ruled out. Hepatic disease has been associated with hypocoagulable and hypercoagulable states. The exact mechanisms involved in hypercoagulability are unknown; however, they are likely multifactorial (28–29). In the veterinary literature, liver disease is less commonly implicated as the cause of prothrombotic states. It is more commonly implicated as a co-morbidity in animals affected with thromboembolic complications (7,30). The dog in this case did not exhibit any biochemical evidence of hepatic disease based on biochemistry and fasting bile acids. The liver appeared subjectively small on imaging, which was substantiated on postmortem examination. Post-prandial bile acids were not performed but could have provided further antemortem evidence of hepatic function. Regardless, any liver disease was below the limit of clinical diagnostic detection. Thus, while liver disease potentially contributed to the prothrombotic state, it was unlikely the primary factor.

Lastly, this patient had been receiving chronic corticosteroid therapy for atopic dermatitis. Corticosteroids have frequently been associated with an increased risk as well as implicated as a cause of thromboembolic complications (7,23–24,30). This is likely a contributing factor to the prothrombotic state in the described animal. Additional characterization of the hemostatic system was not performed but could have provided additional information and potentially elucidated the importance of the underlying hypercoagulability.

The additional changes seen at postmortem, including degenerative vascular disease, acquired extrahepatic shunts, and portal vein thickening are primarily attributed to chronic portal vein thrombosis and secondary vascular changes due to chronic portal hypertension. This presumption is based on the lack of diffuse liver changes indicating a significant primary liver or vascular disease to explain the aforementioned lesions, as well as evidence of chronic thrombus. Alternatively, a primary portal and hepatic degenerative vascular disease cannot be eliminated. However, the described lesions were seen focally in relation to the portal vein thrombosis and not diffusely throughout the liver, which makes this less likely an explanation. The chronicity of the splenic and caval thrombi was unlikely to be a contributing factor to this dog’s acute presentation.

In conclusion, acute mesenteric thrombosis herein was considered to be the primary factor contributing to the patient’s presentation, morbidity, and mortality. The remaining findings appear to be chronic. As advanced diagnostics become more widely used in the human medical field there has been a significant increase in the frequency of diagnosis of mesenteric vein thrombosis (22). Therefore, a high index of suspicion is imperative for the timely diagnosis of this rare and potentially underdiagnosed condition. Rapid recognition and aggressive treatment appear imperative for successful outcome in humans and animals (4,13,22). Physical examination, coagulation testing, abdominal imaging, and abdominal fluid analysis were most helpful in the diagnosis of this animal. Advanced imaging may have been able to provide additional confidence in antemortem diagnosis.

References

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Mammary development, hyperestrogenemia, and hypocortisololemia in a male cat with an adrenal cortical carcinoma

Amy C. Nadolski, Jessica E. Markovich, Samuel H. Jennings, Orla M. Mahony

Abstract — A 14-year-old neutered male domestic shorthaired cat was diagnosed with an adrenal cortical carcinoma causing hyperestrogenemia that resulted in mammary hyperplasia and sexual behavior. A right adrenalectomy and mammary gland biopsy were performed. Adrenal cortical neoplasia should be ruled out in any neutered male cat with mammary development and/or exhibiting sexual behavior.

Introduction

Adrenal neoplasia is reported to account for 0.2% of all feline neoplasms (1). Of the cats with functional adrenal cortical tumors, 50% were adrenal cortical adenomas and 50% were carcinomas (2). Functional adrenal cortical tumors produce excessive amounts of aldosterone, cortisol, sex hormones, or a combination of these hormones (2). However, most functional adrenal tumors produce excessive amounts of aldosterone or cortisol (3). There are 7 case reports in the veterinary literature describing excessive sex hormone production in cats with adrenal tumors (4–10). Only 1 case report also described sexual behavior: a spayed female cat exhibiting cyclic estrous behavior (9). This is the first case report of an estrogen-secreting adrenal cortical carcinoma with resulting mammary development and sexual behavior in a male cat.

Case description

A 14-year-old, 5.3-kg, neutered male domestic shorthaired cat was presented for 2 palpable mammary masses the owner detected 1 mo earlier. The owner reported that the cat had been vocalizing and mounting the other male cat in the household. On physical examination, there were 2 firm mammary masses present in the right and left caudal chains. The cat had mild epaxial muscle loss and several missing teeth. The remainder of the physical examination was normal. A complete blood (cell) count (CBC) showed a stress leukogram and an unremarkable serum chemistry profile. Blood pressure was not measured due to the fractious nature of the patient. A fine-needle aspirate was performed on both mammary masses and submitted for cytology. The cytology of both mammary masses was interpreted as cystic lesions with pyogranulomatous inflammation and hemorrhage. Biopsy was recommended to couple with the fine-needle aspiration to increase the diagnostic accuracy and rule out an underlying neoplasm with secondary inflammation (11,12). An endocrine tumor was the top differential for mammary development as well as the unexplained sexual behavior; therefore, an abdominal ultrasound was recommended. The abdominal ultrasound revealed right adrenomegaly with an irregular, lobulated cortical contour (2.0 cm × 1.0 cm) and no evidence of vascular invasion. A scant amount of anechoic effusion was present around the caudal aspect of the right adrenal gland. The left adrenal gland width was at the low end of the normal range (3 mm) (13). Bilaterally, the renal parenchyma was diffusely hypechoic with ill-defined and irregular corticomedullary junctions and 2 large bilateral cortical infarcts. The other abdominal organs were unremarkable. An adrenocorticotropic hormone (ACTH) stimulation test was performed using cortrosyn (Amphastar Pharmaceuticals, Rancho Cucamonga, California, USA) and a 250 μg dose of cortrosyn was administered intramuscularly. The mean baseline serum cortisol concentration was 2.5 μg/dL. The mean peak serum cortisol concentration was 11.8 μg/dL. The mean ACTH concentration was 18.7 pg/mL. There was no suppression of the serum cortisol concentration upon ACTH stimulation. The ACTH stimulation test was interpreted as positive for an adrenal neoplasm. An abdominal ultrasound revealed bilateral adrenal masses measuring 2.3 cm × 1.8 cm and 2.3 cm × 1.0 cm, respectively. Both adrenal masses were solid with well-defined margins and no evidence of vascular invasion. A right adrenalectomy and mammary gland biopsy were performed. The right adrenal gland was firm, tan, and 3.5 cm × 2.5 cm × 2.0 cm. The left adrenal gland was normal in appearance and 3.0 cm × 1.5 cm × 1.2 cm. The mammary gland biopsy revealed hyperplasia with cystic degeneration. The mammary gland was tan, firm, and 2.0 cm × 2.0 cm × 1.5 cm. The mammary gland was submitted for histopathology and was interpreted as a hyperplastic mammary gland. The left breast was submitted for histopathology and was interpreted as a cystic lesion with pyogranulomatous inflammation and hemorrhage.

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California, USA), 125 μg, IM. Serum was submitted to the University of Tennessee for an adrenal profile, measuring cortisol, androstenedione, estradiol, progesterone, 17 OH progesterone, testosterone and aldosterone pre- and post-ACTH administration before and after adrenalectomy. This will be referred to as “adrenal panel” for the remainder of the article. It showed hyperestrogenemia (Table 1) and hypocortisolemia post-ACTH administration. At this time, the owners reported a subtle coat color change from black to brownish red. A right adrenalectomy and mammary gland biopsy were recommended.

One month after initial presentation, the owners decided to pursue surgery. A recheck abdominal ultrasound showed the right adrenal gland mass was static in size with no vascular invasion. The owners reported the mammary masses had spontaneously resolved 1 wk earlier. Physical examination was unchanged from 1 mo earlier, except for the absence of palpable mammary masses. A pre-operative CBC and serum chemistry profile were unremarkable. Analysis of urine collected by cystocentesis showed a urine specific gravity of 1.028, 1+ protein, 3+ heme and red blood cells that were too numerous to count. Three-view thoracic radiographs were taken and demonstrated mild cardiomegaly, mild hepatomegaly, but no evidence of metastatic neoplasia. The patient was pre-medicated with oxymorphone (DSM Pharmaceuticals, Parsippany, New Jersey, USA), 0.1 mg/kg body weight (BW), IV, midazolam (West-Ward Pharmaceuticals, Eatontown, New Jersey, USA), 0.2 mg/kg BW, IV, and ketamine (Pfizer, New York, New York, USA), 5 mg/kg BW, IV, induced to effect with propofol (Abbott Laboratories, Chicago, Illinois, USA), 2.8 mg/kg BW, and maintained on isoflurane (Abbott Laboratories). A right adrenalectomy and left caudal abdominal mammary gland biopsy were performed. Both tissues were submitted for histopathology. A constant rate infusion (CRI) of dexamethasone SP (Bimeda-MTC Animal Health, Cambridge, Ontario) was run at 0.06 mg/kg BW per hour during surgery and at 0.05 mg/kg BW per hour after surgery for hormone replacement therapy. No complications were encountered during surgery and the patient recovered uneventfully from anesthesia. A fentanyl CRI (Hospira, Lake Forest, Illinois, USA) 3 mg/kg BW per hour during surgery and at 0.05 mg/kg BW per hour after surgery for pain control, and oral clopidogrel (Apotex, Toronto, Ontario), 3.5 mg/kg BW, q24h, for 1 mo. Histopathology of the right adrenal gland revealed an adrenal cortical carcinoma with mild invasion through the adrenal capsule. The neoplasm appeared completely excised, although neoplastic cells extended to less than 1 mm from the tissue margins.

The mammary gland biopsy showed expansion of the subcutis by hyperplastic to occasionally mildly dysplastic alveoli and

| Table 1. Levels of serum androstenedione, estradiol, progesterone, 17 OH progesterone, testosterone and aldosterone pre- and post-ACTH administration before and after adrenalectomy |
|-----------------------------|-----------------------------|-----------------------------|
| Test                        | Pre-adrenalectomy           | 18 mo post-adrenalectomy    |
|                            | Result | Reference interval | Result | Reference interval |
| Androstenedione (nmol/L) baseline | 0.22   | 0.35 to 2.1        | 0.35   | 0.35 to 2.1        |
| Androstenedione (nmol/L) 30 min post ACTH | 2.7    |                  | 1.4    |                  |
| Androstenedione 60 min post ACTH | 1.7    | 1.8 to 9.8        | 1.6    | 1.8 to 9.8        |
| Estradiol (pmol/L) baseline | 343.2  | 143.5 to 327.8    | 210.3  | 143.5 to 327.8    |
| Estradiol (pmol/L) 30 min post ACTH | 320.8  |                  | 226.5  |                  |
| Estradiol (pmol/L) 60 min post ACTH | 321.6  | 140.6 to 308.4    | 190.2  | 140.6 to 308.4    |
| Progesterone (nmol/L) baseline | 0.51   | 0.16 to 2.2       | < 0.64 | < 0.64 to 2.2     |
| Progesterone (nmol/L) 30 min post ACTH | 1.2    |                  | 3.2    |                  |
| Progesterone (nmol/L) 60 min post ACTH | 1.3    | 2.2 to 14.6       | 2.1    | 2.2 to 14.6       |
| 17 OH Progesterone (nmol/L) baseline | 0.45   | 0.24 to 0.91      | 0.27   | 0.24 to 0.91      |
| 17 OH Progesterone (nmol/L) 30 min post ACTH | 0.76   |                  | 1.55   |                  |
| Testosterone (nmol/L) baseline | 0.00   | 0.00 to 0.02      | 0.72   | < 0.52 to 1.74    |
| Testosterone (nmol/L) 30 min post ACTH | 0.00   |                  | 0.73   |                  |
| Testosterone (nmol/L) 60 min post ACTH | 0.00   | 0.00 to 0.02      | 0.70   | < 0.52 to 1.74    |
| Aldosterone (pmol/L) baseline | 31.3   | 31.3 to 815.6     | No values |                  |
| Aldosterone (pmol/L) 30 min post ACTH | 189.7  |                  | No values |                  |
| Aldosterone (pmol/L) 60 min post ACTH | 111.5  |                  | No values |                  |

* Reference intervals for neutered male cats.
Table 2. Levels of serum cortisol pre- and post-ACTH administration before and after adrenalectomy

<table>
<thead>
<tr>
<th>Test</th>
<th>Pre-adrenalectomy</th>
<th>5 mo post-adrenalectomy</th>
<th>18 mo post-adrenalectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Result</td>
<td>Reference interval²</td>
<td>Result</td>
</tr>
<tr>
<td>Cortisol (µg/dL) baseline</td>
<td>19.6</td>
<td>14.6 to 162.8</td>
<td>82.8</td>
</tr>
<tr>
<td>Cortisol 30 min post ACTH</td>
<td>12.4</td>
<td></td>
<td>107.6</td>
</tr>
<tr>
<td>Cortisol 60 min post ACTH</td>
<td>15.7</td>
<td>213.8 to 513.1</td>
<td>137.9</td>
</tr>
</tbody>
</table>

³ Reference intervals for neutered male cats.

Ducts, both of which were frequently distended by secretory material and occasionally by pyogranulomatous inflammation with tufts of hyperplastic epithelium and granulation tissue. Along the periphery of the gland were a few clusters of ducts surrounded by concentric arrays of presumptive myoepithelial cells, creating small foci reminiscent of the fibroadenomatous hyperplasia seen more diffusely in some cycling female cats or in cats receiving synthetic progestrogens. As the overall lobular architecture of the gland was intact and the dysplasia seen was mild, the process was considered reactive rather than neoplastic.

Approximately 5 mo after the adrenalectomy, the cat was doing well at home with no change in weight. A CBC and total T4 were unremarkable. Urinalysis showed a urine specific gravity of 1.029 and benign sediment. Serum chemistry revealed a mild hypercalcemia [2.95 mmol/L, reference interval (RI): 2.05 to 2.70 mmol/L], hyperkalemia (5.7 mmol/L, RI: 3.4 to 5.6 mmol/L) and low sodium:potassium ratio (27, RI: 32 to 41). Baseline aldosterone level was low (146 pmol/L, RI: 3.4 to 5.6 mmol/L, RI: 2.05 to 2.70 mmol/L, hyperkalemia (5.7 mmol/L, RI: 3.4 to 5.6 mmol/L) and low sodium:potassium ratio (27, RI: 32 to 41). Baseline aldosterone level was low (146 pmol/L, RI: 3.4 to 5.6 mmol/L) and low sodium:potassium ratio (27, RI: 32 to 41). Baseline aldosterone level was low (146 pmol/L, RI: 3.4 to 5.6 mmol/L) and low sodium:potassium ratio (27, RI: 32 to 41). Baseline aldosterone level was low (146 pmol/L, RI: 3.4 to 5.6 mmol/L) and low sodium:potassium ratio (27, RI: 32 to 41). Baseline aldosterone level was low (146 pmol/L, RI: 3.4 to 5.6 mmol/L) and low sodium:potassium ratio (27, RI: 32 to 41).

An adrenal panel was repeated one month later at the University of Tennessee (Tables 1 and 2) with cortrosyn (125 µg IM) showing continued hypocortisolemia post-ACTH. Estradiol levels were normal and the patient’s coat color had returned to the previous black color.

Discussion

Functional adrenal cortical carcinomas (ACC’s) producing excessive sex hormones are rare in cats. Of the 7 case reports in the literature, 3 reported a combination of hormones (4–6), and 4 were specific to sex hormones as in the case reported herein (7–10). Only 1 of these cases (9) had hyperestrogenemia, a 15-year-old spayed female cat exhibiting cyclic intermittent estrous behavior secondary to increased basal concentrations of estradiol, progesterone, 17-hydroxyprogesterone, and androstenedione. Our patient also exhibited sexual behavior. This case report is unique in that only estradiol was increased, leading to a mammary hyperplasia. Mammary development secondary to hyperestrogenemia from adrenal cortical tumors has also been reported in a ferret (14) and in humans (15–20).

An integrated case report published in 1993 describes a ferret with an estrogen-producing adrenal tumor (21) that displayed similar signs to those in the spayed female cat (9). Most ferrets with hyperadrenocorticism produce sex hormones (mainly androstenedione, 17-hydroxyprogesterone, dehydroepiandrosterone sulfate and estradiol) rather than cortisol (22).

In addition to hyperestrogenemia, a blunted cortisol response post-ACTH was seen before surgery and persisted for 19 mo after adrenalectomy. It is unknown why the cortisol levels remained low but this may be due to delayed recovery of the remaining atrophied adrenal gland. The patient did not require supplementation past the initial post-operative period; however, the owner described transient gastrointestinal signs when they moved. Low cortisol levels post-ACTH stimulation have been described previously in cats and dogs with adrenal tumors (9,23).

The patient had a subtle coat color change that resolved over time. There are 2 proposed potential causes; high estrogen and its increase on hair pigmentation as seen in mice (24) and/or low alpha melanoctye stimulating hormone secondary to low ACTH. Endogenous ACTH was not determined in this case, but would have been an essential piece of information. The DiaSorin immunoradiometric assay is validated for use in cats, but, to the authors’ knowledge, is not commercially available (25).

A significant portion of the mammary enlargement seen histologically was due to dilation of the ducts. It is possible hyperplasia occurred in other mammary glands, but didn’t have the duct dilation component which made these glands stand out. While most cats with histopathological fibroepithelial/ fibroadenomatous hyperplasia have enlargement of all glands, some feline cases don’t involve all glands. This would support a hormone-responsive process that isn’t as symmetrical or diffuse as one might expect.

No recurrence of mammary development or clinical signs were seen post-adrenalectomy. The cat is approximately 600 days...
post-adrenalectomy. Survival after adrenalectomy and long-term is good for feline adrenal cortical tumors (1), as in ferrets in which prognosis is good with low metastatic potential (26).

Adrenal cortical carcinoma should be excluded in any neutered male cat presenting for mammary development and/or sexual behavior. An adrenal panel can be beneficial as part of the pre-operative work-up to identify hypocortisolemia and hypersecretion of more than 1 hormone; therefore, improving the intra- and post-operative management of the patient. In addition, it would be advantageous to recheck ACTH-stimulation tests on these patients, especially in times of illness. If an adrenalectomy is carried out, clinical signs secondary to excessive sex hormone production are likely to resolve and there is a good prognosis for long-term survival.

References

Diagnostic value of creatine kinase activity in canine cerebrospinal fluid
Alexandra Ferreira

Abstract — This study aimed to determine whether creatine kinase (CK) activity in cerebrospinal fluid (CSF) has diagnostic value for various groups of neurological conditions or for different anatomical areas of the nervous system (NS). The age, breed, results of CSF analysis, and diagnosis of 578 canine patients presenting with various neurological conditions between January 2009 and February 2015 were retrospectively collected. The cases were divided according to anatomical areas of the nervous system, i.e., brain, spinal cord, and peripheral nervous system, and into groups according to the nature of the condition diagnosed: vascular, immune/inflammatory/infectious, traumatic, toxic, anomalous, metabolic, idiopathic, neoplastic, and degenerative. Statistical analysis showed that CSF-CK alone cannot be used as a diagnostic tool and that total proteins in the CSF and red blood cells (RBCs) do not have a significant relationship with the CSF-CK activity. CSF-CK did not have a diagnostic value for different disease groups or anatomical areas of the nervous system.

Résumé — Valeur diagnostique de l’activité de la créatine kinase dans le liquide céphalorachidien canin. Cette étude a visé à déterminer si l’activité de la créatine kinase (CK) dans le liquide céphalorachidien (LCR) avait une valeur diagnostique pour les divers groupes d’affections neurologiques ou pour les différentes régions anatomiques du système nerveux (SN). L’âge, la race, les résultats de l’analyse LCR et le diagnostic de 578 patients canins présentant diverses affections neurologiques, entre janvier 2009 et février 2015, ont été recueillis rétrospectivement. Les cas ont été répartis selon les régions anatomiques du système nerveux, c.-à-d., le cerveau, la moelle épinière et le système nerveux périphérique et selon les groupes conformément à la nature de l’affection diagnostiquée : vasculaire, immunitaire/inflammatoire/infectieuse, traumatique, toxique, anormale, métabolique, idiopathique, néoplasique et dégénérative. L’analyse statistique a démontré que l’analyse LCR-CK ne peut pas être utilisée à elle seule comme outil de diagnostic et que les protéines totales dans le LCR et les érythrocytes n’ont pas un impact important sur l’activité LCR-CK. L’analyse LCR-CK n’a pas eu une valeur diagnostique pour les divers groupes de maladie ou les différentes régions du système nerveux.

(Traduit par Isabelle Vallières)

Can Vet J 2016;57:1081–1086

Introduction
Cerebrospinal fluid (CSF) analysis assists in establishing a neurological diagnosis and is commonly carried out when inflammatory, infectious, traumatic, neoplastic, or degenerative disorders of the nervous system (NS) are suspected (1). However, CSF analysis may support only the suspicion of an NS disorder and rarely provides a definitive diagnosis (1).

In 1 study, creatine kinase (CK) was reported to be the predominant enzyme found in all areas of the canine brain, with the highest activity detected in the neocortex, caudate nucleus, and cerebellum and less activity found in the cerebral white matter, hippocampus, pons, and thalamus (2). Creatine kinase is composed of M and B subunits and may be traced in the brain, muscle, and heart. Three isoenzymes can be produced based on the combination of the 2 CK subunits: MM (CK-MM), predominantly in skeletal and cardiac muscle; BB (CK-BB), mainly present in the brain; and MB (CK-MB), predominantly in the heart (3). The determination of CK isoenzymes in 5 brain regions of 2 dogs showed CK-BB, CK-MM, and CK-MB fractions of 95.8% to 98.2%, 1.2% to 3%, and 0.2% to 0.8%, respectively, of the total CK activity (2).

A study on cerebral infarction in humans, based on autopsy volume of the affected area revealed a close correlation between the amount of brain injury and CSF-CK activity (4). Additionally, individuals with low Glasgow Coma Scale scores after head injury presented with high CK-BB activity, and this correlated with the degree of injury. It has also been reported that in humans CSF CK-BB has a prognostic value in subclinical brain trauma (5) and recovery after cardiac arrest (6). Other studies in human medicine emphasized that patients with acute
spinal cord trauma presenting with high levels of CSF CK-BB never recovered (7). The presence of CK-BB in CSF appears to be clinically significant in humans with acute trauma of the central nervous system (CNS) but not in non-traumatic diseases (7). The optimal timing of CSF sampling for CK-BB analysis has not been precisely determined and appears to vary according to the type of brain injury sustained. For example, CK-BB is useful as a prognostic indicator in humans if a CSF sample is collected between 12 and 15 h after acute head injury (8). CK-BB is also useful for detecting hypoxic brain injury if CSF is collected 28 to 76 h after cardiac arrest in humans (9) or 48 to 72 h after cardiac arrest in dogs (2). In dogs with thoracolumbar disc disease, CSF-CK is suspected to peak at 48 h following the onset of clinical signs and again between days 7 and 17 after the onset of paresis/paraplegia (10).

There is no correlation between CSF-CK values obtained from fresh and frozen samples (11), so only fresh samples should be evaluated. Another factor to consider is that CK-BB has a half-life of 1 to 5 h (12) and a proportion of enzymes is inactivated inside and around damaged cells. Indeed, only a portion is released into the CSF, where the activity can be further decreased by dilution, thermal inactivation, diffusion, and light (2,11).

Nonetheless, there are few publications in veterinary medicine regarding the use of CSF-CK. Congenital malformations (13) and light (2,11).

The ANOVA results showing no correlation between the variables

<table>
<thead>
<tr>
<th>Area of the nervous system</th>
<th>Nature of the condition (total number of cases)</th>
<th>Diagnosis</th>
<th>Number of cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brain (n = 409)</td>
<td>Anomalous (n = 15)</td>
<td>Intracranial cyst</td>
<td>7 (47%)</td>
</tr>
<tr>
<td></td>
<td>Idiopathic (n = 248)</td>
<td>Epilepsy</td>
<td>246 (99%)</td>
</tr>
<tr>
<td></td>
<td>Inflammatory/immune/infectious (n = 71)</td>
<td>Meningoencephalitis of unknown origin (MUO)</td>
<td>41 (58%)</td>
</tr>
<tr>
<td></td>
<td>Metabolic (n = 7)</td>
<td>Reactive seizures</td>
<td>7 (100%)</td>
</tr>
<tr>
<td></td>
<td>Neoplastic (n = 27)</td>
<td>Intracranial tumor</td>
<td>27 (100%)</td>
</tr>
<tr>
<td></td>
<td>Toxic (n = 5)</td>
<td>Suspected toxicity</td>
<td>5 (100%)</td>
</tr>
<tr>
<td></td>
<td>Traumatic (n = 3)</td>
<td>Head trauma</td>
<td>3 (100%)</td>
</tr>
<tr>
<td></td>
<td>Vascular (n = 33)</td>
<td>Cerebral/cerebellar vascular accident</td>
<td>33 (100%)</td>
</tr>
<tr>
<td>Spinal cord (n = 117)</td>
<td>Anomalous (n = 1)</td>
<td>Dermoid sinus</td>
<td>1 (100%)</td>
</tr>
<tr>
<td></td>
<td>Degenerative (n = 43)</td>
<td>Intervertebral disc disease</td>
<td>36 (84%)</td>
</tr>
<tr>
<td></td>
<td>Inflammatory/immune/infectious (n = 50)</td>
<td>Steroid responsive meningitis-arteritis</td>
<td>48 (96%)</td>
</tr>
<tr>
<td></td>
<td>Neoplastic (n = 4)</td>
<td>Spinal cord tumor</td>
<td>4 (100%)</td>
</tr>
<tr>
<td></td>
<td>Trauma (n = 4)</td>
<td>Spinal cord trauma</td>
<td>4 (100%)</td>
</tr>
<tr>
<td></td>
<td>Vascular (n = 15)</td>
<td>Fibrocartilagenous embolic myelopathy</td>
<td>15 (100%)</td>
</tr>
<tr>
<td>Peripheral nervous system (n = 52)</td>
<td>Degenerative (n = 1)</td>
<td>Polineuropathy</td>
<td>1 (100%)</td>
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<tr>
<td></td>
<td>Idiopathic (n = 35)</td>
<td>Geriatric vestibular disease</td>
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</tr>
<tr>
<td></td>
<td>Inflammatory/immune/infectious (n = 11)</td>
<td>Trigeminal neuropathy</td>
<td>3 (27%)</td>
</tr>
<tr>
<td></td>
<td>Metabolic (n = 2)</td>
<td>Vestibular syndrome secondary to otitis external and media</td>
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</tr>
<tr>
<td></td>
<td>Neoplastic (n = 3)</td>
<td>Deafness</td>
<td>3 (27%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scottie cramp</td>
<td>1 (50%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hypothyroid associated peripheral vestibular syndrome</td>
<td>1 (50%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Peripheral nerve sheath tumor</td>
<td>2 (67%)</td>
</tr>
</tbody>
</table>

Table 2. The ANOVA results showing no correlation between the variables

<table>
<thead>
<tr>
<th></th>
<th>Difference</th>
<th>Sum square</th>
<th>Mean square</th>
<th>F-value</th>
<th>P-value</th>
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<tr>
<td>Anatomical area</td>
<td>2</td>
<td>1.49</td>
<td>0.75</td>
<td>2.18</td>
<td>0.1147</td>
</tr>
<tr>
<td>Nature of the condition</td>
<td>8</td>
<td>3.21</td>
<td>0.40</td>
<td>1.17</td>
<td>0.3166</td>
</tr>
<tr>
<td>Residuals</td>
<td>457</td>
<td>156.86</td>
<td>0.34</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
and chronic disease (14) do not appear to cause any increase in CSF-CK. Although the measurement of this enzyme in dogs does not appear to be diagnostically specific for different NS conditions (15,16), it is reported to have a prognostic value (15), at least in acute intervertebral disc herniation (11). Although CSF-CK alone is not useful as a diagnostic tool for meningitis in humans, associated with other markers, it may support its diagnosis (17,18).

In humans CSF-CK is not correlated with serum CK activity as the blood-brain-barrier seems to be impermeable to CK (17,19). Also, contamination of CSF with whole blood, hemo-
lyzed RBCs, or serum does not substantially contribute to an increase in CSF-CK activity (16).

The aim of this study was to determine in a large canine population examined at a referral veterinary hospital between 2009 and 2015 whether the CSF-CK tested routinely as part of a standard CSF analysis has diagnostic value for neurological conditions. The authors hypothesize that, based on human reports, the CSF-CK alone will not be sufficient but may aid the clinician with diagnosis of certain conditions.

**Materials and methods**

The results of CSF analysis for 578 canine patients presenting to the neurology service of a private referral veterinary hospital between January 2009 and February 2015 were retrospectively collected. The CSF samples were part of the routine procedures performed to establish a diagnosis. Data collected included the breed, age, gender, diagnosis, and CSF analysis.

The following inclusion criteria were adopted: i) dogs presenting with a neurological condition that had undergone magnetic resonance imaging (MRI) (0.3 Tesla VerMR Grande, ESAOTE, Genoa, Italy) and CSF collection as part of the diagnostic evaluation; ii) final diagnosis established; and iii) CSF collection from the cerebellomedullary cistern under general anesthesia using a previously described technique (20).

Cerebrospinal fluid was collected into two 1.5-mL polyvinyl tubes containing ethylenediamine tetraacetic (EDTA), with 2 drops of formalin 10% added (21) to 1 tube for cytological evaluation. The other tube was used for total protein concentration determination and total cell count, and was refrigerated at 4°C (22) for a maximum of 72 h. The CSF-CK analysis was performed using an automated chemistry analyzer (Ilab 650; Instrumentation Laboratory, Diamond Diagnostics, Holliston, Massachusetts, USA) that is used for determining the serum total CK activity in human patients (10).

Over 1000 cases were analyzed. Cases excluded from the study included dogs diagnosed with a multifocal condition, cases in which a final diagnosis was not established or those in which the CSF sample collected was not sufficient to have all parameters evaluated.

The remaining cases were divided according to the anatomical area of the NS: the brain, spinal cord (SPC) and peripheral nervous system (PNS). The cases were also divided into groups of neurological disease according to the etiology: vascular, immune/inflammatory/infectious, traumatic, toxic, anomalous, metabolic, idiopathic, neoplastic or degenerative.

A sample was considered to be contaminated with blood if it had a pink or red coloration at collection and, after centrifugation, there was a red cellular pellet at the bottom of the tube, with a colorless supernatant (23). Xanthochromia was characterized by a yellow-orange discoloration of the CSF, resulting from a previous hemorrhage and the accumulation of oxyhemoglobin or methemoglobin derived from erythrocyte degradation (23).

The variability of CSF-CK was plotted by boxplot graphic for various anatomical areas of the NS and the nature of the condition diagnosed. The effect of the anatomical areas and nature of the condition on the variability of CSF-CK was analyzed using a 2-way analysis of variance (ANOVA) after log transformation of the actual CSF-CK value, to stabilize the variance.
Dogs were grouped according to the size of the breed as directed by the British Kennel Club. Crossbreeds of different sizes were classified under “variable.” Red blood cells in the CSF data from all cases were also collected to establish the relationship with CSF-CK. All the CSF samples obtained with RBCs in this population were described as blood contaminated.

Results

Five hundred and seventy-eight dogs were studied, 283 (49%) of which had an idiopathic condition and 132 (23%) of which had an inflammatory/immune/infectious disease. Of these 132, 3 (2%) cases had infectious disease, 38 (29%) had an inflammatory condition, and 91 (69%) had an immune disorder. Of the 578 dogs that were studied 48 (8.3%) had a vascular problem, 44 (7.6%) had a degenerative condition, 34 (5.9%) had a neoplastic disease, 16 (2.8%) were anomalous, 9 (1.5%) had a metabolic disease, 7 (1.2%) suffered trauma, and 5 (0.8%) presented with toxicity (Table 1). Ages of dogs ranged from 10 mo to 14 y [median: 4 y (1st quartile 2 y); (3rd quartile: 7 y)]. There were 168 males, 182 neutered males, 94 females, and 134 neutered females. Eighty-seven breeds were represented, 201 (35%) of which were large breeds, 197 (34%) were medium, 144 (25%) were small, and 34 (6%) were classified as variable. Breed information was missing for 2 dogs. Four hundred and nine dogs had diseases localized in the brain, 117 in the SPC, and 52 in the PNS. CSF-CK showed great variability, ranging from 0 to 693 IU/L (SD = 73.01) and a median of 22.0 IU/L (1st quartile = 8.00, 3rd quartile = 55.7). Similarly, there was great variability of total protein in the CSF (min = 3.0 g/L, max = 565.0 g/L), with a right-skewed distribution in the sample, an average of 0.32 g/L (SD = 0.48) and a median of 0.20 g/L (1st quartile = 0.15, 3rd quartile = 0.30). Blood contamination was identified in 268 samples, ranging from 1 to 120 000 cells/µL. Distribution of RBCs was right-skewed with an average of 711.3 cells/µL (SD = 6362) and a median of 0.0/µL (1st quartile = 0.0, 3rd quartile = 10.0), min = 0 and max = 120 000/µL.

Statistical analysis revealed that CSF-CK and RBCs results do not correlate (Spearman’s rho coefficient is 0.09, P-value = 0.03). There is also no correlation between CSF-CK and the total protein present in the CSF (Spearman’s rho coefficient is 0.13, P-value = 0.002). The CSF-CK shows great variability between anatomical area and nature of the condition (Figure 1), which suggests that CSF-CK by itself cannot be used as a diagnostic indicator to determine the nature of the condition that affects the animal or the area of the NS involved. An ANOVA analysis of the data (Table 2) shows that the differences in CSF-CK between anatomical areas and between the various conditions are not statistically significant, which confirms what is seen in the boxplots (Figures 1 and 2).

Discussion

In this large retrospective study, there was no relationship between CSF-CK and breed size, age, gender and the affected anatomical area of the NS. No relationship was expected between CSF-CK and the PNS because the main isoenzyme measured is suspected to be CK-BB (2,18,22,24) and this is only present in astrocytes and neurons (24). There was also no correlation between CSF-CK and various disease groups. Blood contamination did not correlate with the presence of CSF-CK, which is in agreement with a previous study (16). Although the blood-brain-barrier is impermeable to CK, it was not possible to ascertain in any of the studies if this barrier had been compromised or not. The protein concentrations and CSF-CK were also not correlated, which is in agreement with previous reports (15,16).

The authors excluded lumbar samples from the study to decrease the variables that could influence the results (lumbar samples have different reference ranges from cisternal samples). However, in some of the spinal cord disorders (thoracolumbar localization) it would have been more appropriate to obtain a lumbar CSF sample. One of the limitations of this study is that...
the method of CK analysis routinely available in laboratories is that used for human serum, and it is possible that this might not be adequate for the analysis of CSF-CK (8). With regard to the measurement of total CSF-CK, and not specifically of CK-BB in the CSF, CK-BB represents up to 95% of the total CK activity in the brain with the remaining 5% derived from mitochondria (22). Therefore, measuring either total CK or CK-BB in CSF has the equivalent informative value (18,22) and total CK is the parameter that is routinely measured (10,11,13,15,16,18,19).

Another factor that might have influenced the results is the time lapse between the onset of clinical signs and the collection of the CSF. When the variation of CSF-CK was assessed in dogs with thoracolumbar intervertebral disc disease, the authors identified a peak of CSF-CK at 48 h after the onset of clinical signs and a second peak between days 7 and 17 (10). Thus, it is possible that the time between the onset of clinical signs and CSF collection might have influenced the results (25). Another factor to consider is that CK-BB has a half-life of 1 to 5 h (12) and that a certain proportion of enzyme is inactivated inside and around damaged cells. Only a portion is released into the CSF, where the activity can be further decreased by dilution, thermal inactivation, diffusion, and light (2,11), which may have an implication in the storage of CSE. It also appears that there is no standardization with regard to CSF storage and the time of the analysis. In the limited veterinary studies available, the CSF collected was either analyzed immediately (10,11), at 6 h (16), up to 4 wk (2), or at a time that was not reported (13–15,26). Additionally, the storage temperature was either not recorded (10,11,13,15,16,26), –70°C (2), or –80°C (14). Although no more than 24 h had elapsed between collection and analysis in most of the cases presented, this might have influenced the results obtained. The storage method used in this study is practical for the clinical setting and will not cause important loss of CSF-CK activity up to 48 h (22). It also appears that freezing a sample at –80°C for later analysis will alter CSF-CK values (11).

Another limitation of this study is the type of grouping of the different diseases. The authors chose the generally accepted VITAMID D list for differential diagnosis. These groups are heterogeneous in their pathophysiology, which could alter the significance of the study. However, dividing the study sample further would decrease the power of the study (due to the low number of cases for each diagnosis) and many of the results would likely be invalid.

It was not possible, in a retrospective study with such a high number of cases, to ascertain the importance of CSF-CK in terms of its prognostic value and its correlation with serum levels. However, previous reports are in agreement that a high CSF-CK level suggests a poor prognosis (11,15,19) and that there is no correlation between CSF-CK and serum CK (15,16). The present study supports previous findings obtained from smaller samples (15,16,26) that CSF-CK may be increased in animals with neurological diseases.

The CSF-CK by itself does not seem to be a valid diagnostic marker for various neurological conditions; nevertheless, the time of analysis in relation to collection might have an impact on the results obtained. Blood contamination does not significantly affect the CSF-CK activity. Further studies are needed to understand whether CSF-CK which is analyzed immediately or after standardized storage procedures can be correlated with different areas of the NS or with disease groups. In addition, it would be interesting to understand if the effect of time of sampling with regard to onset of the condition alters the CSF-CK value in a way that it may be used diagnostically.

The authors found no relevant relationship between CSF-CK and the anatomical area of the NS or etiology of the condition. Blood contamination and total proteins in the CSF did not show a significant relationship with the CSF-CK activity.

Acknowledgments

The author thanks Massimo Tranquillo for his invaluable assistance with the statistical analysis, Arran Clegg for his support and correction, and Nick Carmichael at CTDS Ltd. for his support in the analysis of the samples throughout the years.

References

Simultaneous staphylectomy and unilateral arytenoid lateralization in dogs presenting for dyspnea: 23 cases (2010–2013)

Ann E. Heffernan, Jeffery J. Biskup, Betty A. Kramek, Greg M. Anderson

Abstract — This retrospective study assessed postoperative complications with simultaneous staphylectomy and unilateral arytenoid lateralization (SP + UAL) in dogs with laryngeal paralysis and concurrent elongation of the soft palate compared to dogs having a UAL alone. Medical records of dogs having a UAL performed from 2010 to 2013 were reviewed. Twenty-three dogs were diagnosed with a concurrent elongated soft palate and had a SP + UAL performed and 89 dogs were diagnosed with an appropriate soft palate and had only a UAL performed. A telephone questionnaire for long-term postoperative outcomes was completed. Survival probability was not statistically different between the 2 groups. Dogs in the SP + UAL group were more likely to be seen for respiratory distress after surgery ($P = 0.05$). There was no significant difference between the 2 groups in the number of dogs which developed postoperative aspiration pneumonia. The overall complication rate for both groups was high, with postoperative pneumonia being the most common complication.

Résumé — Staphylectomie et latéralisation unilatérale de l’arythénœide simultanées chez des chiens manifestant de la dyspnée : 23 cas (2010–2013). Cette étude rétrospective évalue les complications postopératoires associées à une staphylectomie et à une latéralisation unilatérale de l’arythénœide (SP + LAU) simultanée chez des chiens atteints de paralysie laryngée et d’allongement concomitant du palais mou comparativement à des chiens atteints seulement de LAU. Les dossiers médicaux de chiens qui avaient subi une LAU de 2010 à 2013 ont été examinés. Vingt-trois chiens ont été diagnostiqués avec un palais mou allongé concomitant et ont subi une SP + LAU et 89 chiens ont été diagnostiqués avec un palais mou conforme et avaient subi seulement une LAU. Un questionnaire téléphonique pour les résultats postopératoires à long terme a été rempli. La probabilité de survie n’était pas statistiquement différente entre les deux groupes. Il était plus probable que les chiens du groupe SP + LAU soient examinés pour une détresse respiratoire après la chirurgie ($P = 0.05$). Il n’y avait pas de différence statistiquement significative entre les deux groupes quant au nombre de chiens qui ont développé une pneumonie de déglutition postopératoire. Le taux de complication global était élevé pour les deux groupes et la pneumonie postopératoire était la complication la plus fréquente.

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Introduction

Laryngeal paralysis, which results in the inability to abduct the arytenoid cartilages during inspiration (1–4), can be a congenital condition in dogs, but is more commonly acquired (2,3). The most common form of acquired laryngeal paralysis is a generalized peripheral polyneuropathy recently labeled as geriatric onset laryngeal paralysis polyneuropathy (GOLPP) (2,4,5), which results in degeneration of laryngeal innervation and is a common cause of dyspnea in middle-aged to older large-breed dogs, with Labrador retrievers being over-represented (1,34,6). Clinical signs associated with laryngeal paralysis include inspiratory stridor, dyspnea, exercise intolerance, collapse, dysphonia, coughing, gagging, and hyperthermia (2–4,7). Dogs affected with GOLPP also have progressive pelvic limb weakness, muscle atrophy, and esophageal motility disorders (2,4,5).

Paradoxical movement (adduction during inspiration) of the arytenoid cartilages is seen in up to 45% of dogs with laryngeal paralysis (2). An increase in negative upper airway pressure has been documented with paradoxical movement of the arytenoid cartilages and has been suggested to lead to secondary elongation of the soft palate in brachycephalic breeds (2,8,9). However, there is no literature confirming that an increase in negative
upper airway pressure leads to elongation of the soft palate in dogs. Nonetheless, there is a local reflex response with increased electromyographic activity of the soft palate and epiglottic musculature in the face of negative upper airway pressure in the dog (10,11). Soft palate muscle recruitment during negative upper airway pressure is thought to be helpful in preventing collapse of the upper airway and reducing negative pressure. This local reflex in the soft palate and epiglottic musculature is lost when the internal branches of the cranial laryngeal nerves are bilaterally transected (10,11). Degeneration of the cranial laryngeal nerves in dogs with GOLPP may lead to a reduced ability to decrease upper airway pressure because of an inability to augment the soft palate and epiglottis appropriately. A paretic soft palate, therefore, may be more prone to elongation due to increased negative airway pressure. Elongated soft palates may exacerbate upper airway obstruction, as seen in brachycephalic breeds (12–18). Therefore, respiratory signs in a dog with laryngeal paralysis and an elongated soft palate may benefit from correction of both disorders. A staphylectomy could reduce upper airway obstruction and help alleviate part of the cause for increased negative upper airway pressure in dogs afflicted with both an elongated soft palate and laryngeal paralysis.

Surgical management for laryngeal paralysis is palliative and is intended to increase the size of the glottis, thereby reducing upper airway resistance and negative pressure. Multiple surgical procedures have been developed and successfully applied to dogs suffering from laryngeal paralysis. Unilateral arytenoid lateralization (UAL) is considered the procedure of choice for laryngeal paralysis due to a reduced risk of laryngeal web formation, reduced rates of aspiration pneumonia, and a lower postoperative mortality rate (0% to 14%) compared to conventional partial or complete arytenoidectomy (1–4,19). Aspiration pneumonia is the most common serious complication following a UAL and occurs in 18% to 28% of dogs following the procedure (1,3,4,6). Many dogs continue to have clinical signs of coughing, choking, gagging, exercise intolerance, and weakness after a UAL because their disease is a progressive polyneuropathy. However, clinical signs in dogs with an elongated soft palate can be similar in appearance.

The length of the soft palate in an average mesaticephalic dog is 6 cm (20). The caudal border of the soft palate overlaps slightly with the tip of the epiglottis but generally extends no further than the mid to caudal aspect of the tonsillar crypt (20,21). An elongated soft palate overlies the epiglottis often by more than 1 cm and frequently has a pinched or pointed appearance from being drawn into the larynx on inspiration (21). The standard treatment for dogs with an elongated soft palate is partial resection so that the caudal border of the palate is level to the caudal pole of the tonsil (14,15,22,23). Excision with a scalpel or scissors followed by primary closure with apposition of the oropharyngeal and nasopharyngeal mucosa is the traditional method for removing the elongated portion of the soft palate (14,15,17). The most commonly reported complication following staphylectomy is dyspnea, attributable to pharyngeal edema and inflammation (15,16,22). Long-term complications in dogs that have undergone staphylectomy include aspiration pneumonia, nasal aspiration, and occasionally chronic rhinitis or sinusitis (15,22). Excessive resection of the soft palate may result in nasal regurgitation, rhinitis, and sinusitis (15,21).

Respiratory complications such as dyspnea and aspiration pneumonia overlap between the 2 procedures. No studies have evaluated whether a staphylectomy and UAL (SP + UAL) performed simultaneously in dogs result in an increased risk of developing postoperative respiratory complications. The first objective of this study was to determine if dogs undergoing simultaneous correction (SP + UAL) had a difference in survival time compared to those undergoing only a UAL. The second objective was to determine if there was an increased risk of postoperative respiratory complications in dogs having a SP + UAL compared with dogs having only a UAL. We hypothesized that there would be no difference in survival time or increase in postoperative respiratory complications in dogs undergoing the simultaneous procedure compared to those undergoing a UAL only.

Materials and methods

Electronic medical records of all dogs that had a UAL procedure for laryngeal paralysis at the University of Minnesota Veterinary Medical Center between January 2010 and June 2013 were
retrospectively reviewed. Standard of care had been provided to each animal. Cases were included in the study if they met the following criteria: were dogs presenting for dyspnea; were diagnosed with idiopathic, acquired laryngeal paralysis confirmed by laryngoscopy; had documentation in the medical record of the surgical procedure performed; and had completion of a telephone questionnaire or perioperative death at the time of follow-up. Breeds that are predisposed to brachycephalic airway syndrome were excluded because of their differences in upper respiratory anatomy from mesaticephalic dogs. Cases were divided into 2 groups: i) dogs that were diagnosed with laryngeal paralysis and concurrent elongated soft palate that had a SP + UAL, and ii) dogs that were diagnosed with laryngeal paralysis that had a UAL.

Information on signalment, age at time of the surgical procedure, and immediate post-operative complications was obtained from the medical record. Owners of the dogs included in the study were contacted by telephone to answer a questionnaire (Figure 1) on postoperative clinical signs and complications. Cause of death and postoperative survival times were recorded. Owners were asked if their dog suffered from any respiratory disease after the surgical procedure and if hospitalization or medical management was required. Specifically, a complication of aspiration pneumonia was documented if a dog was reported to be seen by a veterinarian and treated with antibiotics for suspected pneumonia.

In all dogs, a laryngoscopy following sedation was performed to confirm the diagnosis of laryngeal paralysis. Laryngeal examination was performed at the time of induction of anesthesia for the surgical procedure by the boarded surgeon responsible for the case. Propofol (Propoflo; Abbott Laboratories, Abbott Park, Illinois, USA) was used for sedation during the laryngeal examination. A diagnosis of laryngeal paralysis was made if there was minimal or absent abduction of the arytenoid cartilages. Paradoxical movement of the arytenoid cartilages was also used to confirm the diagnosis of laryngeal paralysis. If necessary, doxapram (Dopram; Zoetis, Tadworth, Surrey, UK) was administered to stimulate ventilation during the laryngeal examination. The soft palate was evaluated without placing traction on the tongue. A diagnosis of elongated soft palate was made if the caudal border of the soft palate extended 1 cm or more beyond the tip of the epiglottis.

Anesthetic protocol varied among the dogs in this study. Dogs were intubated and anesthesia was maintained with isoflurane or sevoflurane in oxygen. Isotonic crystalloid fluid was administered intravenously during the surgical procedure and adjusted by the anesthesiologist. Cefazolin (Ancef; Hospira, Lake Forest, Illinois, USA), 22 mg/kg body weight (BW), IV, was administered 20 min prior to the start of the surgical procedure and then given every 2 h for the duration of the surgery. The use of opioids was minimized during premedication and postoperative recovery. A board-certified surgeon was present at the time of all surgeries. Surgical procedures were performed by multiple board-certified surgeons and surgery residents.

Dogs that were diagnosed with an elongated soft palate in addition to laryngeal paralysis were placed in sternal recumbency first, with the upper jaw suspended by a metal frame placed behind the maxillary canine teeth and attached to the surgical table. The oropharynx was packed with gauze. The proposed level of palate resection, located at the caudal border of the palatine tonsils, was evaluated with minimal traction on the tongue or palate. The caudal edge of the palate was retracted rostrally. An incision was made at the level of the caudal border of the palatine tonsils. Resection was performed with scissors. A continuous suture pattern using 3-0 or 4-0 absorbable suture, depending on the size of the dog, was then used to appose the oral and nasal epithelial surfaces of the cut edge of the soft palate. The type of suture varied depending on surgeon preference but included either polyglactin 910 (Ethicon, Somerville, New Jersey, USA) or poliglecaprone 25 (Ethicon).

A UAL was performed in right lateral recumbency. A skin incision was made over the left side of the larynx just ventral to the jugular groove. The dorsal edge of the thyroid cartilage was rotated laterally to expose the thyropharyngeus muscle, which was incised transversely to increase exposure. After the muscular process of the arytenoid cartilage was palpated, the cricoarytenoideus dorsalis muscle inserting on the process was transected. Disarticulation of the cricoarytenoid articulation was performed, and 2 separate strands of either 0 or 2-0 polypropylene (Ethicon) were used to secure the muscular process of the arytenoid cartilage to the caudal dorsal edge of the cricoid cartilage. An intraoperative laryngeal examination was performed to document left arytenoid abduction. Closure of the surgical site was routine.

To minimize sedation, postoperative use of opioids was avoided unless signs of pain, such as tachycardia and discomfort on palpation of the surgical site, were noted. Nonsteroidal anti-inflammatory drugs and local anesthetics were used to control postoperative pain. Endotracheal tubes were removed when the dog was able to swallow. Dogs were monitored closely for postoperative dyspnea and agitation. Low doses of acepromazine (PromAce; Boehringer Ingelheim Vetmedica; St. Joseph, Missouri, USA), 0.01 to 0.05 mg/kg BW, IV or SC, were administered as needed for sedation. If no immediate complications were noted the dogs were discharged the same day. Discharge instructions recommended feeding moist food for a period of time and transitioning the dog to dry food if tolerated. Use of a harness was recommended. Dogs were to be restricted from rigorous activity for 2 wk. Owners were instructed to seek veterinary attention immediately if there were signs that might indicate aspiration pneumonia such as an increase in respiratory rate, respiratory effort, decreased appetite, increasing cough, or lethargy.

Statistical analysis
All statistical analysis was performed using standard software (R Project for Statistical Computing, Vienna, Austria). A Kaplan-Meier survival curve was used to compare the survival probability of the dogs in the SP + UAL and UAL only groups. A log rank test was used to evaluate statistical significance between the 2 curves. A P-value ≤ 0.05 was considered significant. Logistic regression was used to compare, between the 2 groups, the number of individuals that had respiratory complications, aspiration pneumonia, respiratory distress, coughing,
gagging, difficulty swallowing, changes in respiratory noise, and changes in the ability to perform activities. A likelihood ratio test was used to evaluate the statistical significance of the logistic regression; a $P$-value $\leq 0.05$ was considered significant.

**Results**

A total of 116 dogs had a UAL performed. Four dogs predisposed to brachycephalic airway syndrome were excluded; 3 pugs from the SP + UAL group and 1 pug from the UAL group. Twenty-three dogs were diagnosed with a concurrent elongated soft palate and had a simultaneous SP + UAL, and 89 dogs were diagnosed with an appropriate soft palate and had only a UAL. Signalment characteristics (age, gender, and breed) among surgical groups were similar (Table 1).

Follow-up data were available on 17 of the SP + UAL dogs and 46 of the UAL dogs. Two dogs from each group died or were euthanized within 48 h of surgery. One of these dogs in the SP + UAL group was euthanized because of pneumonia, and the other experienced cardiopulmonary arrest for unknown reasons. One of the 2 dogs from the UAL group was euthanized because, for unknown reasons, it was not recovering well after surgery and the other died of respiratory arrest. Two of the owners (12%) from the SP + UAL group reported that their dogs had worse or no improvement (scores: 0, 1) in respiratory noise after surgery. Twenty dogs from the UAL group had a single episode, within 2 mo after surgery, that resolved with sedation. The fifth dog continued to have respiratory distress at times of excitement to the point of occasional collapse.

When owners rated their dog’s change in respiratory noise after surgery on a 0 to 5 scale (0 — worse than before surgery to 5 — very good improvement), no dogs were reported to have worse respiratory noise in the SP + UAL group. Two dogs had no improvement in respiratory noise in the SP + UAL group. Two dogs had worse respiratory noise in the UAL group and 8 had no improvement in respiratory noise in the UAL group. There was no significant difference in the proportion of dogs that had worse or no improvement (scores: 0, 1) in respiratory noise between the 2 groups ($P = 0.66$). The median respiratory noise rating was 5 (range: 1 to 5) and 4.5 (range: 0 to 5) for the SP + UAL and UAL groups, respectively. Eleven dogs (73%) and 32 dogs (73%) were reported to have a good to very good improvement (scores: 4, 5) in respiratory noise after surgery ($P = 0.96$) in the SP + UAL and the UAL groups, respectively.

Fifteen and 44 owners from the SP + UAL and UAL groups, respectively, completed a telephone questionnaire. The median time to telephone questionnaire after surgery was 18 mo (range: 7.2 to 24 mo) and 18 mo (range: 6 to 36 mo) for the SP + UAL and UAL groups, respectively. Table 2 summarizes the differences in the incidence of various respiratory complications between the 2 groups. Statistically, more dogs in the SP + UAL group developed respiratory distress compared to the UAL group ($P = 0.05$), with the proportion developing postoperative respiratory distress being 29% and 9% in the SP + UAL group and UAL group, respectively. Four of the 5 dogs reported to be seen for respiratory distress in the SP + UAL group had a single episode, within 2 mo after surgery, that resolved with sedation. The fifth dog continued to have respiratory distress at times of excitement to the point of occasional collapse.

<table>
<thead>
<tr>
<th>Signalment characteristics</th>
<th>SP + UAL ($n = 23$)</th>
<th>UAL ($n = 89$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age in years (range)</td>
<td>11 (3 to 14)</td>
<td>12 (5 to 15)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MN (57%)</td>
<td>13</td>
<td>50</td>
</tr>
<tr>
<td>FS (39%)</td>
<td>9</td>
<td>33</td>
</tr>
<tr>
<td>MI (4%)</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>FI (5%)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Breed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labrador retrievers (61%)</td>
<td>14</td>
<td>56</td>
</tr>
<tr>
<td>St. Bernards (13%)</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Golden retrievers (9%)</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>American Staffordshire terrier</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Greyhound (1%)</td>
<td>1</td>
<td>1 Nova Scotia duck tolling retriever</td>
</tr>
<tr>
<td>Viszla (2%)</td>
<td>1</td>
<td>1 American Staffordshire terrier</td>
</tr>
<tr>
<td>Siberian husky (1%)</td>
<td>1</td>
<td>1 Giant schnauzer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Viszla</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Newfoundland</td>
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<tr>
<td></td>
<td></td>
<td>1 Irish setter</td>
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<td></td>
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<td>1 Great Pyrenees</td>
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<tr>
<td></td>
<td></td>
<td>1 Cocker spaniel</td>
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<tr>
<td></td>
<td></td>
<td>1 Mastiff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Plott hound</td>
</tr>
</tbody>
</table>

MN — male neutered; FS — female spayed; MI — male intact; FI — female intact.

**Table 1.** Summary of signalment characteristics between the simultaneous staphylectomy and unilateral arytenoid lateralization (SP + UAL) and unilateral arytenoid lateralization (UAL) only groups.
Owners were asked via a telephone questionnaire whether their dog had been diagnosed and treated for pneumonia after surgery. The gold standard diagnosis of pneumonia is based on clinical signs, thoracic radiographs, and a positive microbial culture of fluid collected by transtracheal wash, endotracheal lavage, or bronchoalveolar lavage (24). Some owners reported that their veterinarian did not take thoracic radiographs to confirm a diagnosis of pneumonia, but the dog's clinical signs improved with antibiotic therapy. This may have led to an overall higher complication rate of aspiration pneumonia in both groups because a presumptive diagnosis of aspiration pneumonia appears to have been made in several cases.

The incidence of dogs having postoperative respiratory distress that required veterinary attention was statistically significant between the 2 groups; dogs in the SP + UAL group had a 29% predicted probability of developing respiratory distress compared to 9% of dogs in the UAL group. The most commonly reported complication after a staphylectomy is dyspnea attributed to postoperative swelling (15,16,22). Therefore, dogs undergoing the simultaneous procedure may be expected to have an increase in dyspnea in the short-term postoperative period. However, only 1 of the 5 SP + UAL dogs with respiratory distress had an onset of respiratory distress within 48 h of surgery. The remaining 4 dogs developed respiratory distress after surgical inflammation would have been expected to resolve. Possible causes for dyspnea not associated with surgical inflammation for these cases could be failure of the UAL, laryngeal collapse, eversion of the laryngeal saccules, inadequate soft palate resection or soft palate dysfunction, underlying lung disease from chronic respiratory distress, and pneumonia. Postoperative results from a larger sample size are needed to definitively assess the significance of this finding.

The number of dogs that coughed and gagged after the procedure was not statistically significant between the 2 groups. Many of the dogs in this study were reported to cough and gag prior to the procedure. Because of the nature of GOLPP, it is not surprising that many dogs continued to cough and gag after the procedure had been done. Persistent coughing was not reported to be associated with pneumonia in any of these cases; however, not all dogs had thoracic radiographs performed, and it is possible that low-grade or recurrent pneumonia was the cause of persistent coughing.

Four dogs (27%) and 3 dogs (7%) were reported to have difficult or exaggerated swallowing after the SP + UAL and

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<table>
<thead>
<tr>
<th></th>
<th>SP + UAL</th>
<th>UAL</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total respiratory complications</td>
<td>10/17 (59%)</td>
<td>20/46 (46%)</td>
<td>0.32</td>
</tr>
<tr>
<td>Aspiration pneumonia</td>
<td>5/17 (29%)</td>
<td>16/46 (35%)</td>
<td>0.69</td>
</tr>
<tr>
<td>Respiratory distress</td>
<td>5/17 (29%)</td>
<td>4/46 (9%)</td>
<td>0.05</td>
</tr>
<tr>
<td>Increased coughing</td>
<td>5/15 (33%)</td>
<td>18/44 (41%)</td>
<td>0.60</td>
</tr>
<tr>
<td>Gagging</td>
<td>5/15 (33%)</td>
<td>14/44 (32%)</td>
<td>0.91</td>
</tr>
<tr>
<td>Difficult swallowing</td>
<td>4/15 (27%)</td>
<td>3/44 (7%)</td>
<td>0.06</td>
</tr>
<tr>
<td>Increased sneezing</td>
<td>0</td>
<td>0</td>
<td></td>
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</tbody>
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Table 2. Post-operative complications in dogs in the simultaneous staphylectomy and unilateral arytenoid lateralization group (SP + UAL) compared to dogs that had a unilateral arytenoid lateralization only (UAL). The total respiratory complications category is the combination of the aspiration pneumonia cases and respiratory distress cases. Two dogs were removed from both groups in some of the data due to perioperative death. P-values were determined by a likelihood ratio test.

Figure 2. Kaplan-Meier survival curve analysis of the simultaneous staphylectomy and unilateral arytenoid lateralization (SP + UAL) group and the unilateral arytenoid lateralization (UAL) only group. The number of dogs in each group at different time periods is indicated just above the x-axis. A log-rank test was used to compare statistical significance (P = 0.32); survival curves were not statistically different between the 2 groups of dogs.

Discussion
The results suggest that a staphylectomy performed simultaneously with a UAL increases the risk of postoperative respiratory distress but does not change the overall survival probability of dogs when compared to those having a UAL alone. Therefore, we accept our hypothesis that there was no difference in survival time in dogs between the 2 procedures, but reject our hypothesis that there was no increase in postoperative respiratory complications in dogs undergoing the simultaneous procedure compared to those undergoing only a UAL. There were no statistically significant differences between groups for all other evaluated outcome measures.

Signalment characteristics were consistent with previously reported populations of dogs with laryngeal paralysis in both surgical groups (1,3–5,7). Respiratory complications were common in both groups. The most commonly reported respiratory complication in this study was aspiration pneumonia, which occurred in 29% and 35% of the cases in the SP + UAL and UAL groups, respectively. The most commonly reported complication after a staphylectomy is dyspnea attributed to postoperative swelling (15,16,22). Therefore, dogs undergoing the simultaneous procedure may be expected to have an increase in dyspnea in the short-term postoperative period. However, only 1 of the 5 SP + UAL dogs with respiratory distress had an onset of respiratory distress within 48 h of surgery. The remaining 4 dogs developed respiratory distress after surgical inflammation would have been expected to resolve.

The gold standard diagnosis of pneumonia is based on clinical signs, thoracic radiographs, and a positive microbial culture of fluid collected by transtracheal wash, endotracheal lavage, or bronchoalveolar lavage (24). Some owners reported that their veterinarian did not take thoracic radiographs to confirm a diagnosis of pneumonia, but the dog's clinical signs improved with antibiotic therapy. This may have led to an overall higher complication rate of aspiration pneumonia in both groups because a presumptive diagnosis of aspiration pneumonia appears to have been made in several cases.

The incidence of dogs having postoperative respiratory distress that required veterinary attention was statistically significant between the 2 groups; dogs in the SP + UAL group had a 29% predicted probability of developing respiratory distress compared to 9% of dogs in the UAL group. The most commonly reported complication after a staphylectomy is dyspnea attributed to postoperative swelling (15,16,22). Therefore, dogs undergoing the simultaneous procedure may be expected to have an increase in dyspnea in the short-term postoperative period. However, only 1 of the 5 SP + UAL dogs with respiratory distress had an onset of respiratory distress within 48 h of surgery. The remaining 4 dogs developed respiratory distress after surgical inflammation would have been expected to resolve. Possible causes for dyspnea not associated with surgical inflammation for these cases could be failure of the UAL, laryngeal collapse, eversion of the laryngeal saccules, inadequate soft palate resection or soft palate dysfunction, underlying lung disease from chronic respiratory distress, and pneumonia. Postoperative results from a larger sample size are needed to definitively assess the significance of this finding.

The number of dogs that coughed and gagged after the procedure was not statistically significant between the 2 groups. Many of the dogs in this study were reported to cough and gag prior to the procedure. Because of the nature of GOLPP, it is not surprising that many dogs continued to cough and gag after the procedure had been done. Persistent coughing was not reported to be associated with pneumonia in any of these cases; however, not all dogs had thoracic radiographs performed, and it is possible that low-grade or recurrent pneumonia was the cause of persistent coughing.

Four dogs (27%) and 3 dogs (7%) were reported to have difficult or exaggerated swallowing after the SP + UAL and
UAL procedures, respectively. These numbers neared but did not achieve statistical significance. Humans report difficulty in swallowing with major soft palate defects and soft palate reconstruction (25). It is suspected that the lack of mobility in the soft palate reconstruction accounts for some of the difficulty in swallowing (25). Perhaps mobility of the soft palate is affected by scarring or by inappropriate length after resection. However, the difficult or exaggerated swallowing in both groups could be related to a progression of underlying polyneuropathy associated with GOLPP. Additionally, none of the dogs in this study had an increase in sneezing after surgery, despite previous reports of nasal aspiration and occasionally chronic rhinitis or sinusitis occurring in dogs that have an inappropriately short palate after partial staphylectomy (15,22).

The difference in postoperative respiratory noise was not statistically different between the 2 groups. The SP + UAL dogs did not have a significant improvement in respiratory noise compared to the UAL group. Perhaps the number of cases that had less than good to very good improvement in respiratory noise after surgery would increase if a staphylectomy were not performed in the dogs that were diagnosed with a concurrent elongated soft palate. A control group of dogs diagnosed with an elongated soft palate and laryngeal paralysis that had only a UAL performed without a simultaneous staphylectomy was not available at the time of this retrospective study. This control group would be helpful in determining if the simultaneous procedure improved respiratory noise in this subset of dogs.

Improvement in the ability of dogs to perform exercise or activities within the first 2 mo after the procedure was difficult to assess because of the suspected underlying progressive polyneuropathy. Additionally, comorbidities that could limit improvement in activity, such as arthritis, were not well-documented in all dogs. Owners were asked to recall how their dogs were within the first 2 mo after surgery to try to eliminate progression of underlying diseases influencing the outcome. Only 20% and 34% of cases were reported to have a good to very good improvement in their ability to perform activities within the first 2 mo after surgery in the SP + UAL and UAL group, respectively.

Limitations of this study include its retrospective nature and variability between clinicians and postoperative care, particularly the diagnosis and treatment of aspiration pneumonia. Additionally, accurate measurement of soft palate length is difficult and likely varied among clinicians. This study also required owners to recall information about their dogs, which in itself has a large amount of bias. There was a small sample size and a limited number of cases from each group had follow-up information available (74% in the SP + UAL group and 50% in the UAL group) further decreasing the sample size. There was also no control group of dogs diagnosed with an elongated soft palate and laryngeal paralysis that had a UAL performed without concurrent staphylectomy. Lastly, the telephone questionnaire was not validated.

In conclusion, this study suggests that a staphylectomy performed simultaneously with a UAL does not decrease overall survival probability but might result in an increased incidence of postoperative respiratory distress. Dogs undergoing the simultaneous procedure were not more likely to develop aspiration pneumonia after surgery compared to dogs having only a UAL. Postoperative pneumonia was the most common major complication; it occurred in 29% of dogs that had a staphylectomy performed simultaneously.

Acknowledgments
The Statistical Consulting Center at the University of Minnesota and in particular Lindsey Dietz and Aaron Rendahl helped with the analysis of this study.

References

New Products
Nouveaux produits

Antibiotic Alternative for Cattle Approved for Sale in Canada by the Canadian Food Inspection Agency

NovaVive Inc., a Canadian immunobiology company, today announced that its cattle immunotherapeutic — Amplimune™ — has received approval for sale in Canada by the Canadian Food Inspection Agency (CFIA). The Company believes this is the first antibiotic alternative therapy for livestock to receive Canadian regulatory approval.

Amplimune reduces the clinical signs and mortality associated with E. coli K99 diarrhea in neonatal calves. The product is an emulsion of mycobacterium cell wall fractions (MCWF) that enhances innate immunity to fight bacterial infections without the use of antibiotics. The product can be administered by intravenous, intramuscular or subcutaneous injection.

Antibiotic resistance is an ever-increasing problem in both humans and animals, in Canada and globally. In animals, this has primarily resulted from indiscriminate use and overuse of antibiotics as preventative therapies or growth promoters. “The development of antimicrobial-resistant pathogens in animals can pose serious risks to human health when they are transmitted as food-borne or water-borne contaminants. Antimicrobial-resistant infections are associated with a greater risk of death, more complex illnesses, longer hospital stays and higher treatment costs.” (Health Canada)

In Canada, more than three quarters of all antimicrobials (antibiotics) are sold for use in animals. In 2013, this amounted to approximately 1.6 million kilograms (1600 tonnes). Only 10% of animal antibiotics are used to treat disease and infection, while the remaining 90% are used routinely to promote growth or prevent disease. (Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS) 2008 and Canadian Antimicrobial Resistance Surveillance System — Report 2015)

“There is a growing market for effective antibiotic alternatives,” said Graeme McRae, President of NovaVive Inc. “Products like Amplimune that activate the body’s innate immune system to fight infection and disease are one such alternative. Having met the rigorous efficacy and safety standards of the Canadian Centre for Veterinary Biologics (CCVB) division of the CFIA, we are excited to be taking this proactive step to help Canadian cattle producers curb antibiotic use in their herds.”

Contact: Graeme McRae, President, NovaVive, phone: (613) 391-3837; e-mail: Graeme.McRae@NovaVive.ca; Jennifer Shea, V-P, Investor Relations & Business Development, phone: (613) 391-2097; e-mail: Jennifer.Shea@NovaVive.ca; website: www.NovaVive.ca

THYMOX HOOF® Approved by Health Canada

Laboratoire M2 announces Health Canada’s approval of THYMOX HOOF® as a veterinary drug, a breakthrough in the control of the highly infectious disease, digital dermatitis (DD), which causes lameness and significant losses in dairy cow productivity.

The effectiveness of THYMOX HOOF is based on the action of thymol, an active ingredient found in the plant thyme. THYMOX HOOF has strong anti-microbial properties that kill pathogenic microorganisms such as treponemes. These microorganisms cause DD foot lesions which induce lameness, and as a result lower milk productivity.

Until now, a farm had almost no choice but to use chemicals like copper sulfate, a heavy metal, which is difficult to dissolve, toxic, caustic, and does not degrade when the hoof bath water is released into the soil. Another chemical, formaldehyde, has also been used for decades and is a known carcinogen, and an atmospheric pollutant.

Worldwide, dairy is the most important agricultural product valued at $200 billion, with an estimated 270 million cows who are susceptible to digital dermatitis.

Contact: Laboratoire M2, 4005–A, rue de la Garlock, Sherbrooke, Quebec J1L 1W9; phone: (819) 563-0698; toll free: 1-866-898-0697; fax: (819) 563-9298; e-mail: info@thymox.com; website: www.thymox.com
1. C) This is an FDA-approved treatment for scabies (Sarcoptes scabiei). A, Ivermectin, should be used very cautiously in collies; B, D, and E are not effective against the sarcoptiform mites.

2. D) Masticatory muscle myositis is an immune-mediated disease affecting the muscles of mastication. It results in an inability to open the mouth due to atrophy of the muscles of mastication with severe temporal muscle atrophy. German shepherd dogs and other adult large-breed dogs are affected; the condition is treated with immunosuppressive doses of steroids. Cranio-mandibular osteopathy is a proliferative bone disease seen most often in immature West Highland white terriers and Scottish terriers. These patients present with intermittent fever, pain associated with attempting to eat, and pain when opening the mouth. They have excessive bone proliferation on the ventral aspect of the mandible and the base of the skull, resulting in an inability to open the mouth.

3. A) The ACTH response test is the test of choice. Endogenous ACTH concentration is expected to be elevated with hypoadrenocorticism, but the finding is not specific to this condition.

4. A) Clinical signs of colic include poor appetite, flank watching, distended abdomen, tachycardia, and pale mucous membranes. Getting up and down frequently, rolling, and posturing to urinate are also common signs of colic.

5. B) Zearalenone, a mycotoxin found on some cereal grains (wheat, barley), has estrogenic effects and is known to cause these clinical problems in swine. Aflatoxin is hepatotoxic, fumonis in is hepatic and neurotoxic, deoxynivalenol is GI-toxic, and ergot causes abortions and peripheral gangrene.

A) Le test de réactivité à l’ACTH est l’épreuve de choix. On s’attend à ce que la concentration de l’ACTH endogène soit élevée lors d’hypoadrénocorticisme, mais ce résultat n’est pas spécifique à cette condition.

A) Les signes cliniques de coliques comprennent un faible appétit, le regard au flanc, de la distension abdominale, de la tachycardie et des muqueuses pâles. Les actions de se lever et de se coucher fréquemment, de se rouler par terre et de se positionner pour uriner sont aussi des signes communs de coliques.

B) La zéaralénone, une mycotoxine retrouvée dans certaines céréales (blé, orge), possède des effets oestrogéniques et est reconnue pour causer ces problèmes cliniques chez la truie. L’aflatoxine est hépatotoxique, la fumonisine est hépatotoxique et neurotoxique, le désoxynivalénol est GI-toxic, et l’ergot cause des avortements et de la gangrène périphérique.
Wildlife health: A foundation for preparedness for environmental change

Craig Stephen

Public health, animal production, environmental change, and animal health are inter-related and all are being challenged by unprecedented social and environmental changes. Anticipated consequences of climate and environmental change are occurring faster than expected (1). The UN 2030 Agenda for Sustainable Development recognizes that human prosperity and well-being cannot be achieved without regard to the planet and partnerships. In 2010, the World Animal Health Organization (OIE) concluded that there are correlations between animal production systems, human influence on the environment, climate change, and emerging diseases, but these correlations are difficult to measure and the value of any forecasts of future effects is uncertain. Decision-makers need to be increasingly adept at dealing with surprises and uncertainty-based policy decisions when preparing for the unexpected effects of socio-ecologic change. This article describes some ways the Canadian Wildlife Health Cooperative (CWHC) is contributing to Canada's preparedness for a rapidly changing world.

Environmental health surprises are rarely a “bolt out of the blue,” but rather foreseeable events whose warning signals were not tracked, recognized, or appropriately interpreted. Given wildlife's role as a source of new and emerging infections; their position at the interface between the environment, domestic animals and humans; and their intimate and ongoing interaction with the environment, wildlife can signal changing epidemiological patterns important to public health and agriculture. The Global Early Warning System for Emerging Diseases was built with the idea that wildlife events must be integrated into early warning systems as regular activities as the first step towards better disease intelligence and risk assessment at the animal/human/ecoystem interface. However, only knowing that a pathogen is present is insufficient to judge if an action is warranted. Additional information on potential impacts of the disease and the vulnerability of populations is needed to identify circumstances that require risk management.

The CWHC has been developing evidence and arguments to advocate for a “surprise preparedness” agenda in Canada. Concurrently, we have been generating evidence for a national strategy to more effectively link human-animal-environmental health information as well as working with the Pan American Health Organization to deliver leadership training to improve collaboration capacity on issues shared by the animal, human, and environmental health sectors. In response to the 2014–2015 outbreaks of highly pathogenic avian influenza (AI), the CWHC is working with industry and government to identify environmental early warning signals (such as genomic methods for detecting AI in other environmental media, using citizen science to track changing wild bird exposure likelihoods, and developing more active information outreach tools) in order to inspire early action to gain agriculture and public health protection. The CWHC is evolving its 25-year-old national wildlife disease registry into a health intelligence system. The explosion in the production of digital data has created new opportunities to acquire and share observations from nature that may expand the geographic representation and timeliness of signals for emerging environmental risks and changes in vulnerability. Preliminary work has shown that integration of social media and web-based information with a wildlife disease registry can enable better sharing and access to observations and local knowledge that helps identify “hotspots” of vulnerability in an understandable and actionable manner.

Public and political concern about climate change has never been greater. Given the uncertainties associated with climate change, it is critical to systematically seek collaborations to track and recognize early warning signals that could warn public and animal health sectors of impending change and surprises. The CWHC organized a consultation of 30 academic, government, First Nations and non-profit sector experts to identify priorities at the interface of wildlife health, human health, ecological services, economic activities, and climate change. The goal was to find shared needs and threats that should be addressed through joint action. The participants concluded that climate change will affect disease threats to people and domestic animals by changing probabilities of exposures to infectious and non-infectious hazards through changing wildlife movement, mixing and migratory patterns. Unanticipated impacts on wildlife-associated infectious threats to agriculture and public health will arise because of unpredictable changes in host specificity, threat distribution and changing importance of currently benign infectious and parasitic agents. Pathogen host shifting and altered environmental survival will affect disease patterns and will need to be accounted for when making risk management and surveillance management decisions. Direct effects of climate change as well as impacts on the distributions of contaminants can be expected to affect wildlife immune system functions and, therefore, their susceptibility to infectious
disease. Indirect effects on determinants of public health will likely be more significant than direct disease threats, especially in natural resource dependent communities. Impacts on rural, remote, and Aboriginal community food security are already being realized. Changed economic, recreational, and cultural opportunities can be expected as climate change alters fish and wildlife abundance, distribution, and safety.

The CWHC is working to identify candidate early warning signals to inform climate change preparedness planning. No surveillance systems using animals as indicators of risk have been fully evaluated nor have any climate change forecasting surveillance systems been in operation long enough to make evidence-based recommendations on the species and circumstances that would yield the best early health warning signals. However, past evidence shows the acceptability and utility of wildlife data as indicators of the biological effects of infectious and non-infectious hazards, as well as their use as the first signals of the emergence or incursion of new hazards, and for documenting geographic hotspots for exposures. They can also signal changing community resilience by documenting where wildlife used for food, income, and cultural purposes are at risk. Research and surveillance by the CWHC allow us to track changes at the edges of species distributions and climatic zones. Several CWHC programs are using Arctic wildlife disease to provide insight into future changes in epidemiological systems in temperate systems. Tracking parasite biodiversity over the years has documented new host and geographic records, such as blackfly-transmitted nematodes in moose and deer associated with climatic perturbations (2). In southern Canada, CWHC surveillance programs have identified the presence of non-native vectors and new parasite distributions in elk and white-tailed deer in Saskatchewan as well as the introduction of neotropical fungus in new locations. These observations of shifts in pathogens and vectors are achieved by the CWHC through scanning surveillance, applied and targeted research, and a health intelligence system that draws on a national community of practice spanning multiple sectors.

Vulnerability to climate change effects varies across Canada but indigenous populations and residents of northern and remote communities are especially vulnerable due to their dependence on the land for food. Northern and remote communities are likely to see great changes in their environment — some will ease food security concerns while others could exacerbate already decreasing country food stocks (3). Most interest in the food safety impacts of climate has been on microbiological contamination, but changes are also anticipated for chemical contamination as foodwebs and ecological relations change. Impacts of climate change will differ significantly among the sectors (agriculture, fisheries, and non-commercial food supply), but increased losses due to invasive pests and diseases is a common challenge. Canadian livestock are already realizing the implications for trade from northward moving pathogens as was seen with the occurrence of bluetongue virus outside of an endemic focus in British Columbia. Shifting weather patterns may also influence poultry-waterfowl interaction opportunities, possibly influencing avian influenza viral traffic. Globally, the role of wildlife in livestock diseases is expected to increase in conjunction with human population growth that will increase demand for animal protein, thereby increasing livestock populations. The demand will increase infectious contacts between livestock and wildlife leading to a greater potential for new opportunities for sharing diseases.

Through our position at the human-wildlife interface, the CWHC provides advice and expert opinion to reduce inequities in food safety assurances between people who harvest versus people who purchase their food. The document, “Harvesting seal products of high quality for human consumption” (4) is an example of a CWHC project that supports safe food harvest and economic opportunities while protecting natural resources. Ongoing CWHC surveillance and research help wild animal consumers make healthy choices. For example, through diagnoses of lead intoxication in scavenging birds, CWHC surveillance inspired a risk assessment for hunter lead exposure. In one study, lead was detected in the meat samples from 90% and 70% of the white-tailed deer and moose, respectively, shot with lead ammunition. Subsequent investigation revealed that exposure to lead could be prevented by educating hunters and butchers on preparation and consumption of lead-contaminated meat, and by advocating the use of lead-free ammunition. The CWHC is also leading development of population health approaches to critical country food species by focusing attention on protecting healthy and sustainable food sources rather than the legislated approach which emphasizes response only to selected diseases. Our project with Fisheries and Oceans Canada to adapt the socio-ecological model of health to salmon health management is one example.

Many ecosystems are affected by human releases of contaminants, but, until recently, pollution, emerging diseases, and climate change have often been discussed independently. There is growing evidence that the distribution and impacts of contaminants in wildlife will be affected by climate changes (5). Climate change alterations in food webs, lipid dynamics, ice and snow melt, and organic carbon cycling could result in increased pollutant levels in water, soil, and wildlife. Field studies and opportunistic case studies from accidental exposures have shown that animals and humans have different infectious disease responses associated with their pollution status. These changes have implication for food safety, animal health, and public health. Wildlife have a well-established history as sentinels of health risks from environmental pollutants. Diagnostic investigations by the CWHC support impact assessment of industrial accidents (e.g., spills or wildlife damage in the oil sands) and identification of public health harms from endemic pollution (e.g., gastric neoplasia in St. Lawrence beluga whales as inspiration to reduce persistent organic pollution). More recently, a retrospective study confirmed that poisoning was the most common cause of death in eagles in Saskatchewan, largely attributed to organophosphate/carbamate insecticides, followed by lead toxicity. Organophosphate/carbamate insecticides are often used by individuals to illegally poison other wildlife that they consider a nuisance or threat to their livestock. Our finding of true intersexes plus numerous reproductive anomalies in the small St. Lawrence beluga population is unusual and suggests more attention should be directed
towards endocrine disrupting chemicals in the St. Lawrence watershed.

Antimicrobial resistance (AMR) genes are “environmental pollutants” of great significance. Antibiotics in the environment in biologically relevant concentrations have the potential to select for the growth and spread of resistant bacteria, but the environmental reservoirs of resistance determinants are poorly understood. Methods for monitoring AMR in environmental matrices are needed to better understand the role of environmental hot spots for resistance dissemination (6). Wildlife may function as environmental hotspots given: i) their intimate co-habitation with humans (e.g., urban rodents, bird feeders); ii) their overlapping habitats with livestock operations (e.g., songbirds on feedlots); and iii) the consumption of wildlife with no required meat inspection. The CWHC is helping to find AMR “hotspots” through our scanning surveillance and targeted research projects. This work is expanding our knowledge on the possible role of wildlife as reservoirs or “bridges” of AMR among humans, agriculture, and the environment. For example, methicillin-resistant Staphylococcus aureus and Clostridium difficile were detected in urban rats and antimicrobial resistant E. coli isolated from raccoons in urban and rural settings in Ontario (7–9). Previous work has shown how proximity to a farm greatly increases the probability that small mammals (mice, voles, shrews) will harbor multi-resistant E. coli (10).

Finally, the CWHC is helping us understand the implications of urbanization. Over 80% of Canadians live in an urban center. Urban and suburban growth are creating more opportunities for humans, domestic pets, and wildlife to come into contact. Disease transmission among these groups is perceived to be rare, but as Canadians increasingly urbanize and their knowledge of wildlife decreases, risk perceptions are increasing. The One Health movement has exacerbated these adverse risk perceptions by emphasizing the relationship between wildlife and human disease risk. Urban wildlife populations will grow along with our national trends in urbanization. Sound evidence is required to ensure co-existence with wildlife without undue public or policy reaction to unfounded risk perceptions. Members and affiliates of the CWHC have helped to support evidence-based risk perception, management, and communication by: i) identifying and monitoring urban pathogens and parasites; ii) increasing our understanding of exposure opportunities; and iii) undertaking risk assessments. Recent work, for example, has detected Echinococcus multilocularis in southern Canada (11) and Baylisascaris (raccoon roundworms) in Ontario (12). Other projects helped us to better understand the relationship between features of the urban environment and host abundance and may identify environmental determinants of zoonotic disease prevalence/distribution (12,13). Questions such as, “are Canada geese a public health risk in urban parks, do urban coyote bites necessitate rabies post-exposure prophylaxis, are raccoon roundworms a growing public health threat, and what are the risks of growing urban rat population,” are examples of urban wildlife concerns.

With the looming specter of nasty environmental surprise, achieving animal, environmental, and human health by separate science, policies, and actions is impossible. This article has introduced you to how CWHC surveillance and investigation provide strategic early warning signals to support public health and animal health preparedness for environmental change. Key areas of activity include: i) intersectoral climate change preparedness; ii) food safety and security for vulnerable sectors and populations; iii) anticipating changes in infectious diseases in a changing environment; and iv) changing contaminant exposure pathways. A centralized national wildlife health program can effectively link information and activities for a more efficient and effective adaptation and preparedness program.

References
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What Can’t Be Taught
Ce qui ne s’enseigne pas

A perspective from 10 years of practice

Ali Reid

After 10 years of practice, I have been known to ask myself, if I could go back and give myself advice during my first year of practice, what would I say? Other than the obvious (like always cover anal glands with tissue while expressing lest you shoot yourself in the eye), there are several intangible lessons that aren’t really taught during veterinary school that I would like to share.

Cases will go south

Nothing really prepares you for the first time a case that you are solely in charge of goes poorly or you make a mistake. The best advice I can say is, “Brace yourself. At some point, things will go poorly.” Be honest with the client, treat yourself gently, learn from your mistakes, and move on. Whatever you do don’t internalize it and beat yourself up (which we as doctors tend to do).

Not my circus, not my monkeys

One thing you need to be aware of is that all your clients have monkeys. They may be financial monkeys, or relationship monkeys, or health-related monkeys, or time-management monkeys, etc. etc. What you need to be able to do is recognize your client’s monkeys, especially when they are trying to give them to you. What does it look like when clients try to pass their monkeys off to you? It can sound like, “I’m on a fixed income. I can’t afford that! Can you discount?” or “Do you take payments?” or “I just need a little help this month.” Because you as a veterinarian are a naturally empathic, caring person, you might be tempted to let the client put their monkey on you, but don’t. You can sympathize, but the client’s monkey is just that: his or hers. Not yours. Do your best to provide excellent service, but protect yourself emotionally and mentally and don’t carry your client’s monkeys as your own. Because they aren’t.

Self-care is non-negotiable

We all know that the residents and attendees do their best to challenge us in veterinary school. We basically sacrifice our personal lives on the altar of veterinary medicine in order to obtain the degree, but things are different in the real world. In order for your career to be sustainable, you must take care of yourself. Take personal time, do the things that recharge your battery. Sleep enough. Try to take your lunches and go outside for a walk. Take your vacation days, and don’t go in on your day off. Be a team player, but remember it is ok to say ‘no’ to extra shifts or to taking clients after hours. Utilize your local emergency clinic. Our jobs are hard, and you are not doing yourself or your patients any favors by seeing patients at the end of the day if you are already beyond fried and exhausted. It helps to talk about rough days or cases, then find a safe person to talk to. If you are having ongoing stress or depression, do not ignore the symptoms: get help. Make these habits non-negotiables in your professional life as much as you can, and the sleepless, stressful dog days of veterinary school will fade in the distance.

People skills are a must

So, funny story. Even though bedside manner and chatting up clients are critical to professional success, it turns out that most veterinarians are rated as introverts on the Myers-Briggs personality scale. It is draining and sometimes difficult for us to interact with people. Extroverts don’t get it, but we really have to ramp ourselves up to go in and talk to people all day, and then we need to recharge. As draining as it can be, people skills and learning to love and care for people are just as important as the medicine. The owner is the gatekeeper to the pet’s care, and you need to establish a connection with the client in order to gain trust and get that door open. Humor helps, and telling people you understand and that the situation is tough helps. Master the art of small talk, and you will do well.

Quality of life is as important (or more important) than quantity

In veterinary school medicine rotations, pet owners will often go to extraordinary lengths to extend their beloved pet’s lifespan. While that happens on occasion in general practice, technologies and life-saving treatments need to be doled out with a measure of respect to the pet and the pet parent’s quality of life. What new grads sometimes don’t understand is the unmeasurable depth of guilt that pet owners can experience concerning their pet’s sickness and suffering. They will be blinded by grief, and may choose to extend life longer than they should, just because you can. It is your job to help the client assess quality of life (there are great tools available!) and make decisions based on that assessment. You will be your client’s guide — be wise and prudent and repeat after me: Just because you can, doesn’t mean you should.

Small Animal Veterinarian, Owner, Fredericton Animal Hospital, Past President of the New Brunswick Veterinary Medical Association.

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New CEO for Laboratoire M2

Laboratoire M2, (LabM2) the Sherbrooke, Quebec based company behind THYMOXTM, the new standard in environmentally sustainable disinfecting technologies, is proud to announce that Frank Palantoni, a seasoned global executive, has joined the company as CEO. LabM2 is a portfolio company of Cycle Capital, the most active Canadian cleantech venture capital platform.

Prior to being named CEO, Mr. Palantoni joined LabM2 as a strategic advisor in June 2015. Previously, Mr. Palantoni was President of Pet and Life Science Divisions at Central Garden & Pet (NASDAQ: CENTA) a leading animal health products company. During his 30 year career, Mr. Palantoni has served as Global CEO of Gerber Products, and CEO of Novartis Consumer Health, NA. Earlier, he was amongst the top executives at Groupe Danone, and held senior positions at Kraft and Procter & Gamble.

THYMOXTM’s disruptive and environmentally friendly antimicrobial technology is botanically derived to harnesses the power of nature’s own antimicrobial properties to tackle some of nature’s most difficult pathogenic problems.

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Sanofi and Boehringer Ingelheim sign agreement

On June 27, 2016, Sanofi and Boehringer Ingelheim signed an agreement to transfer Sanofi’s Animal Health business, Merial, to Boehringer Ingelheim. The agreement is part of a deal that will also see Boehringer Ingelheim’s Consumer Healthcare business transfer to Sanofi.

This is a significant milestone for Boehringer Ingelheim as it marks the successful conclusion of exclusive negotiations that began in December 2015. While this is a major development, it is important to note that the two separate companies and remain competitors until the transaction closes, which is expected to happen at the end of 2016. Until that time, business continues to operate as usual.

The decision to swap businesses is one of the most important in the history of Boehringer Ingelheim. Together, Merial and Boehringer Ingelheim anticipate they will deliver greater value, service and innovation to their customers.

Contact: Boehringer Ingelheim (Canada) Ltd., 5180 South Service Road, Burlington, Ontario L7L 5H4; website: www.boehringer-ingelheim.ca

Ringing the Market Closing Bell at Time Square

Two Ontario veterinarians, Dr. Kathy Hrinivich and Dr. Neil Kennedy of Animal Hospital of Cambridge, rang the Market Closing Bell in Times Square on behalf of Trupanion, a Seattle-based pet medical insurance provider this past June 21, 2016. This once in a lifetime opportunity was a part of an all-expenses paid trip to New York in celebration of Veterinarian Appreciation DayTM.

Trupanion recently transitioned from NYSE to NASDAQ, and officially commenced trading on NASDAQ June 17, 2016. The bell ringing ceremony is just one facet of Trupanion’s celebration of veterinarians across North America for the special holiday. Trupanion appreciates the wonderful and sometimes incredibly difficult work veterinarians do day in and day out, and asks pet owners everywhere to show their appreciation.

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Emerging SAESA communication challenges

Myrna Milani

When articles, books, movies, and other media events describing the human physical and mental health benefits of animal companionship first appeared, Dr. Lorakis applauded their appearance because she believed these representations reflected her own views. Her more practical side also initially viewed this all-positive view of the human-animal bond as good for business. However, over time she noticed several disturbing trends that created problems for her and her partner, Dr. Bussino.

One of these may strike a responsive chord in those puzzled by the meaning of the SAESA acronym in this column’s title. It refers to the service, assistance, or emotional support animals used by disabled people. A collective term was chosen because, although multiple organizations and legislative bodies may assign specific definitions and credentials to the animals in each group, there are none upon which all agree. Additionally, members of the public, media, and even those who train or employ these animals may use the terms interchangeably. Consequently, the first communication challenge Drs. Lorakis and Bussino face is accepting that any expectations they maintain regarding the fitness and duties of animals bearing a service, assistance, or emotional support label might not match those of the animal’s owner or even the human medical professional who may have prescribed the animal.

Additionally, their interest in and concern for animal health and welfare causes the practitioners to define the bond as a biological and emotional connection between the person and the animal. The fact that most of the SAESA representations of it position these animals as a means to a human end instead of as living beings with their own physical and mental health needs troubles them.

“Until relatively recently, all of the service animals we saw were carefully bred, selected, and well-trained animals, primarily for the physically disabled,” explains Dr. Bussino. “The dogs and their handlers worked together as a team and the good health and behavior of the animal was considered essential for the success of both. That’s not necessarily the way it is now.”

Dr. Bussino refers to the increased numbers of professionally or self-prescribed SAESA animals their practice now sees. Unlike the service dogs he remembers, many of these animals benefit people with hidden disabilities. (“Hidden disabilities” are those physical and mental impairments that are not immediately apparent. See http://www.disabled-world.com/disability/types/invisible/ for a discussion and list of these.) Consequently, the veterinarians are apt to learn about the animal’s status after-the-fact. Consider the following stressful situations such after-the-fact revelations may generate.

Scenario 1: The client tells the veterinarian that he needs his dog to stabilize him during intermittent emotional breakdowns associated with post-traumatic stress disorder (PTSD). Because of this, he cannot possibly leave the animal for dental prophylaxis, including the removal of several badly infected teeth that are undermining the dog’s health.

Scenario 2: A client presents a previously well-behaved and relaxed pet dog which now displays signs of anxiety, lick granulomas on both front legs, and intermittent loose stool and diarrhea. When asked about any changes in the household, the client explains that she now cares for her 5-year-old autistic grandson. She also notes that she considers the dog a godsend because the highly active child spends several hours daily chasing and “rough-housing” with the dog. This gives her a respite from her caregiving duties.

In these scenarios, clients make unrealistic demands on their animals in an attempt to ensure what those people consider maximum animal benefit for themselves or a loved one. This brings us to the first practitioner communications challenge. Given the growing number of disabled persons in general, practitioners should possess knowledge of national, provincial, or local laws that may limit how much they can ask their clients about their disabilities and the status of their SAESA. Admittedly, even when such laws exist they may be vague or

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conflicting. (The United States federal and state disability laws are good examples of this.) Consequently, it is better to gain this knowledge before situations involving SAESA arise than attempt to gain this information at that time.

The second communication challenge involves the acquisition of more detailed information regarding any disabled client limitations veterinarians may need to take into account when addressing SAESA health or behavioral issues. Logic says that, if the animal was prescribed by a human healthcare professional, that person’s input would be invaluable. However, in order for this to occur 3 things must happen. First, the client must be willing to give the veterinarian permission to contact the professional. Second, the professional must be willing to share information about his/her patient or client with the veterinarian. And third, the human healthcare professional must be aware of and actively involved in the presence of the SAESA in the client’s household.

Applying this to the first scenario, Dr. Lorakis begins by acknowledging how important the dog is to her client’s well-being.

“That’s why it’s so important to keep him healthy,” she continues. “Would you be willing to give me permission to contact your healthcare provider so we can come up with a plan that allows me to remove Zuzu’s infected teeth without causing you or her unnecessary stress?”

In situations in which healthcare professionals give the same careful attention to the prescription of SAESA that they do to the prescription of drugs, veterinarians and human healthcare professionals can discuss the best way to ensure quality human and animal health and well-being. After gaining her client’s permission, Dr. Lorakis calls the healthcare provider, explains how the dog’s condition is interfering with the animal’s ability to provide reliable support for her owner, and enlists the provider’s help. Between the two of them, they formulate a solution that meets canine and client needs.

Sometimes, however, human healthcare professionals may prescribe animals without giving their patients or their caregivers guidance regarding the proper breeding, selection, training, care and treatment of the animal. While some of these professionals simply do not realize all the time and effort that goes into ensuring the success of an SAESA and want to learn more, others do not. Veterinarians and those in the first group can engage in mutually beneficial discussions that represent One Health at its grass roots, practical best. Communicating with those in the second group, on the other hand, can be more challenging. (See http://www.mmilani.com/7270/prescribing-animals-human-health-no-harm/ for a discussion of the human healthcare provider’s role in the SAESA process.)

In the second scenario, the healthcare provider tells Dr. Bussino that she mentioned the use of dogs as support animals for children with autism spectrum disorder (ASD) only to relax her patient’s grandmother.

“That was her first visit with her grandson and I only did it to make her feel more comfortable,” the therapist explained. “When she mentioned she liked dogs, the memory of an article about their use in some pediatric cases of ASD just popped into my head. I personally don’t prescribe animals for any reason. But if I did, I’d never prescribe one for an unpredictably violent child with poor impulse control like her grandson.”

In this scenario, Dr. Bussino receives no support from the healthcare provider regarding how to resolve the canine part of the problem. However, he does learn more about the grandson’s disability and that his client misinterpreted the therapist’s casual dog-related remarks. The child’s therapist also gives the veterinarian permission to share her comments with the child’s grandmother who he already knew loved her dog and never would do anything intentionally to harm the animal. When he presents this information to his client, he also provides information about setting up regular visits from a certified therapy dog-handler team that would benefit her grandson, her, and her dog.

Finally, practitioners may encounter animals that belong to a growing population of fraudulent SAESA bearing fake credentials readily available online. In a worst-case scenario, a fight erupts in the waiting room when a dog wearing a vest that identifies him as an emotional support dog lunges and grabs a smaller dog by the neck. Dogs which behave like this obviously limits veterinarians may need to take into account when addressing SAESA health or behavioral issues. Logic says that, if the animal was prescribed by a human healthcare professional, that person’s input would be invaluable. However, in order for this to occur 3 things must happen. First, the client must be willing to give the veterinarian permission to contact the professional. Second, the professional must be willing to share information about his/her patient or client with the veterinarian. And third, the human healthcare professional must be aware of and actively involved in the presence of the SAESA in the client’s household.

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