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Free proximal cortical ulnar autograft for the treatment of distal radial osteosarcoma in a dog

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Letters to the Editor  Lettres à la rédaction

Severe bilateral microphthalmos in a Pomeranian pup – A comment

Dear Editor,
I am the breeder and owner of the wee Pomeranian puppy that had been blind from birth. My name is Deborah Sullivan and I live in Keswick, Ontario, Canada. This article, which is accessible on PubMedCentral: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2978999/, was published in The Canadian Veterinary Journal (Can Vet J 2010;51:1405–1407). It is about my boy. His registered name is BabyDoll’s Boy Wonder, and we call him “Stevie.” He is now going on 2 years old and is doing amazingly well. He was a Daddy 2 times over with two different girls with NO genetic eye issues at all. We love him so much and just wanted to let you know how he is doing and give you a brief update. I am enclosing a picture of him that was taken last year. He carries an enormous coat rich in color, texture, and beauty. Thank you so much for looking at him at his tiny age. He is and will always be my beloved boy to live his very happy days with me forever. I want to say as well, he is a very happy boy. Thank you again for your expert and loving hands in your diagnosis.

Deborah Sullivan/Wayne Hough
Keswick, Ontario
BabyDoll Pomeranians
http://babydollpoms.tripod.com/

Severe bilateral microphthalmos in a Pomeranian pup – A reply

Dear Editor,
I am currently working in Whitby (since I finished at OVC), and have often thought about Stevie since graduating. I remember him very well. This was definitely the most interesting case that I saw as a student, and I may never see another like it during my career. I am so glad to hear that Stevie is doing so well. It was a pleasure working with him as well as with Deborah.

Thanks so much for the update.

Dr. Melanie Dell
Whitby, Ontario
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Hands up. Who prefers Milbemax?
Dear Editor,

Kudos to Dr. Jim Fairles for his President’s message in the November CVJ (Can Vet J 2012;53:1147–1150), tackling the thorny subject of member wellness in our veterinary profession. Not enough has been done in the past to assist veterinarians — and perhaps more significantly — veterinary students, who suffer in silence from overwhelming emotional, psychological, or physical distress.

The sobering statistics from the national member wellness survey conducted by the CVMA should be a wake-up call for us all.

I’m reminded of a sermon about Three Storms that we all face in our daily lives, individually and collectively. The ongoing storm around us — influenced by world events, stock markets, weather, school, etc., — cannot be controlled by us or our immediate relationships. These stressors must be taken at face value, for better or worse.

The second relates to our actions in the storm — our outward appearance during the hectic day-to-day happenings that affect us. We realize that, come what may, our relationships with our families, co-workers, friends, neighbors, and clients depend on that professional mask we put on each day to make our lives and theirs more tolerable.

And last, but most important, is the storm within each and every one of us that sometimes threatens (and in some cases succeeds) in overwhelming. This most insidious one, left unchecked and unmanaged, proves most likely to leave the victim emotionally destitute and psychologically burned out. Sometimes, solace is sought in a pill, or a bottle, or heaven forbid, a suicide. I trust that some of the proposals discussed at the Summit of Veterinary Leaders forum can assist our profession in reversing these trends that make our chosen vocation the #1 suicide risk in the developed world.

No storm needs to be faced alone; and no storm lasts indefinitely.

Bravo Jim.

Ken Bridge, DVM

---

**Member wellness — A comment**

Dear Editor,

I read with interest your editorial in the December 2012 issue of *The CVJ* addressing an important topic for our profession, namely, pet wellness issues and diagnostic testing. As a veterinary clinical pathologist and clinical research scientist for nearly 50 years, much of my career has been dedicated to screening healthy animals of several species in comparison to those with inherited and acquired disorders. From this work and that of others during the 1970–1990 period came the data to support age-, sex-, and breed type-related norms for most of the clinical pathology reference ranges that are or should be applied today in assessing wellness and disease, especially within and between species, breed types and with aging (1).

In my experience, wellness screening on a regular annual or biannual basis for companion animals is important and does lead to early diagnosis and the possibility of successful intervention. Further support for this conclusion comes from a study done in 1998–1999 by Bruyette et al (2) at VCA West Los Angeles Animal Hospital.

Apparently healthy dogs (*n* = 90) and cats (*n* = 100), all over 7 years of age were studied. They had no underlying medical condition or treatment known to alter clinical laboratory values. After a thorough historical review, the animals underwent a general physical examination and laboratory tests including a CBC, serum chemistry profile, T4, urine cortisol:creatinine ratio (UCCR, dogs only), and complete urinalysis (cystocentesis samples). Only animals with a normal physical examination were selected (2).

**Dogs.** Increased ALP was seen in 15 (17%) dogs. Of these, 4 had increased UCCR, and 3 of them had abnormal low-dose dexamethasone suppression (LDDS) tests of pituitary-dependent hyperadrenocorticism. In 26 (29%) dogs, total T4 values were below normal. Eleven were re-evaluated and 9 were diagnosed with hypothyroidism based on low free T4 by equilibrium dialysis values. Eleven (11%) of the dogs had bacteriuria and pyuria. Four were also azotemic, in the absence of clinical dehydration, consistent with possible pyelonephritis. Urine specific gravities of 2 of them were 1.026 and 1.015, and both had positive urine cultures. This highlights the importance of performing a routine urinalysis, preferably on urine collected by cystocentesis, as part of the routine health assessment.

**Cats.** Elevated T4 was noted in 6 (16%), but a thyroid nodule was palpable in only 1 of them. Nine cats were azotemic based on elevations in blood urea nitrogen (BUN) and creatinine in the absence of clinical dehydration. Five of them had urine specific gravity below 1.035. One cat was diagnosed with diabetes mellitus based on persistent hyperglycemia and glucosuria.

The study concluded that the importance of routine veterinary visits and diagnostic laboratory screening becomes even greater as pets age. The overall prevalence of disease found in these apparently healthy dogs and cats was one of the most valuable findings. Despite the fact that these animals were not being treated for any underlying medical problems, clinically significant disease was found in more than 20% of the canine population and more than 17% of the feline population (2).

W. Jean Dodds, DVM

Hemopet

Santa Monica, California, USA

www.hemopet.org

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**References**


The case for pet wellness and routine monitoring — A reply

Dr. Dodds makes a compelling case in support of pet wellness and routine clinical examination and laboratory tests. I am pleased that she chose to share her considerable experience and expertise with readers of The CVJ. Sincere thanks.

Carlton Gyles, Editor-in-Chief
The Canadian Veterinary Journal
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* Silybin complexed with phosphatidylcholine, which has been shown to significantly increase bioavailability2

1. Vétoquinol study number 208NP2F2

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Recently I received an e-mail from a pet owner. It grabbed my attention as the title was “Are vets supporting pet theft and neglect?” The author, Karen, indicated that she had arranged to leave her 3 cats at a boarding facility in Laval when she was going to Germany for a 6-week visit. A week later, when she was in Germany, she received word that all 3 cats had escaped through an unsecured window. She was distressed but hopeful because all 3 cats carried microchips.

Since her return to Canada, Karen has been able to find 2 of the missing cats. She found one of the cats sitting in a window in a house in Montreal, 20 kilometres away from the boarding facility. That cat had been with a family who had found her and had taken her to a veterinarian for a checkup. Karen’s e-mail to me was to ask me to remind veterinarians of the importance of checking for microchips in animals that are new to their practice, especially those declared as found animals. Karen was aware of the collar tag containing a phone number that is provided for each pet when it receives a microchip but noted that these break-away collars are easily released and lost when a cat’s collar becomes tangled.

Microchips are widely used by animal shelters and humane societies, and by a low percentage of pet owners as a valuable aid in identification of pets that may be lost or stolen. Microchips are passive radio frequency identification systems that have no power source and depend on a scanner for transmission of the information they hold (1). They have saved some lost pets from euthanasia and have contributed to many a happy reunion between a lost pet and its distraught owner. Microchipping has been suggested to be particularly important for cats vaccinated against FIV as these cats may be considered to be infected with FIV and euthanized if they are picked up by animal control. Some jurisdictions, such as El Paso, Texas, recognize the value of microchips and have passed legislation requiring that “Dogs, cats and ferrets shall be registered, vaccinated and have an implanted microchip …” (2). Since 1999 Australia has required that all cats and dogs have microchips. Although some individuals have

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publicized data suggesting that microchips may cause cancers in rodents and dogs (3) microchips appear to be safe.

Battery-operated GPS devices attached to the collar are also being used to track dogs. These are usually recommended for dogs that weigh 10 or more pounds. Computers and cell phones are used along with the device so that, if the dog leaves a designated safety zone, an e-mail or text message is sent to alert the owner. With some devices these zones can extend as far as 1000 meters. Because collars can be lost or removed, some pet owners may choose to have their dogs fitted with both a GPS and a microchip.

Unfortunately, there are some gaps in the system. One of these is failure to ensure that the microchip is registered correctly and that phone number information is updated if the owner moves. Also, some microchips may move from the site of implantation and it is suggested that at each checkup owners ask the veterinarian to scan the chip to ensure that it is in the right location and is working properly. Yet another problem is that there are multiple databases that hold the microchip identification numbers, requiring the use of several scanners. This is being addressed in the United States by efforts to create an umbrella database that has all the data (1).

Another gap is that a veterinarian may fail to check for a microchip in a new pet. This is one gap that can be closed by continuous vigilance on the part of veterinarians in practice.

References
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*It is believed that 10% of all cats experience allergic dermatitis, although reliable epidemiological data is not available.  **Data on file.

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Ethical question of the month — February 2013

When there is public outcry concerning specific practices in companion animal or food animal husbandry, a typical response by the respective organizational representatives is to refer to breed or industry standards. Referring to such standards has been used to defend a variety of practices including tail docking and ear cropping in dogs, gestation crates in sows, and castration without analgesia in calves. Are references to breed or industry standards a legitimate approach by which to defend practices that create public concern for either pet or production animals?

Question de déontologie du mois — Février 2013

Lorsqu'il y a un tollé général concernant des pratiques particulières de l'élevage des animaux de compagnie ou des animaux destinés à l'alimentation, la réponse habituelle des représentants des organisations respectives consiste à s'appuyer sur les normes des races ou de l'industrie. Ces normes ont été utilisées pour défendre diverses pratiques, incluant l’amputation de la queue et la coupe des oreilles chez les chiens, les cages de gestation pour les truies et la castration sans analgésie chez les veaux. La consultation des normes de races ou de l'industrie constitue-t-elle une approche légitime pour défendre les pratiques qui soulèvent l’inquiétude du public à l’égard des animaux de compagnie ou de production?

Comments/Commentaires :

Name/Nom :

Address/Adresse :

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

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

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 D' Tim Blackwell, Science vétérinaire, ministère de l’Agriculture, de l’Alimentation et des Affaires rurales de l’Ontario, 6484, chemin Wellington 7, unité 10, Elora, (Ontario) N0B 1S0; téléphone : (519) 846-3413; télécopieur : (519) 846-8178; courriel : tim.blackwell@ontario.ca

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.
Ethical question of the month – November 2012

Investments in modern livestock facilities are costly and require decades to recover once the buildings are in production. An ever increasing number of large, influential retail businesses selling products of animal origin are setting standards for the housing and management of cattle, pigs, and poultry in response to their customers’ demands. These companies are requiring changes from their suppliers within 5 to 10 years regarding how livestock are raised. These deadlines are well before many current facilities will be paid for or will be in need of major renovations. Even livestock producers who are planning to expand or renovate within the time period set by these companies are concerned that their new facilities may not be compliant with these same companies’ subsequent series of demands. The companies have made these announcements regarding welfare standards without consulting or offering compensation to the producers on whom the entire cost of meeting these demands rests. It appears to livestock producers that this is a public relations effort which is completely at their expense. Should producers be expected to bear the full cost of such well-intentioned announcements?

An ethicist’s commentary on whether producers should bear the cost of animal welfare modifications

This case embodies one of the relatively rare ethical dilemmas we have discussed, with putatively legitimate arguments on both sides pulling in opposite directions. Let us consider the gestation crate as a case in point. When such crates were introduced, they were heralded by many, animal scientists and consumers alike, as highly beneficial in allowing great ease of feeding the animals, checking their health, ensuring high litter count, and generally keeping the cost of pork at a reasonable level. For years, producers reaped great benefits from systems based in gestation crates. They were legally permitted, and not seen as generating any welfare or ethical issues. For these reasons, it seems prima facie unfair to impose a financial burden on producers at this point in time.

On the other side, there certainly were people opposed to gestation crates from the first moment of their inception, and they were consistently criticized for their effects on sow welfare. One could legitimately argue, based on experience in Great Britain and in continental Europe, going back to Ruth Harrison’s classic indictment of industrial agriculture, Animal Machines, the controversy that the book engendered, and the conclusions drawn by the prestigious Bramble Commission about the unacceptability of such severe confinement, that the bubble was likely to burst eventually. After all, only an idiot or a person blinded by greed would fail to realize that ordinary people would eventually be horrified by keeping an animal, possessed of bones and muscles and a nature that compels her to cover a mile a day foraging, in an enclosure 2-feet wide by 3-feet high by 7-feet long where she cannot stand up, turn around, and sometimes cannot even lie in a fully extended position. Thus, the industry is at least somewhat disingenuous when it cries “foul!”

The customer, after all, is king, as both Smithfield farms and Maple Leaf realized in 2008 when both agreed to abandon crates. So what would be a fair resolution of this dilemma? One obvious solution would be to allow producers currently using gestation crates to wait until the current buildings need to be replaced and recapitalized. But restaurants and supermarkets, and very likely the majority of consumers driving the demand for elimination of gestation crates, are not disposed to wait for fulfillment of their moral demands. So it is unlikely that these consumers will be willing to accept increased costs for pork products in order to help producers.

Perhaps a practicable and reasonable compromise would be for the producers to absorb part of the cost under the rubric of “the price of doing business.” The rest could be absorbed by the community as a whole that is driving a new social ethic regarding animal welfare. This could be accomplished by providing tax breaks for producers compelled to spend significant amounts of money to meet societal demands. In this way, the entire burden would fall neither on pork consumers or pork producers, but would instead be shared among all those who will benefit ethically or financially from the mandated change. A similar argument would of course apply to battery cages for laying hens or to veal crates.

Bernard E. Rollin, PhD
1. What is the primary reason for using diazepam in conjunction with ketamine in cats?
   a. to counteract the salivation associated with ketamine
   b. to provide additional analgesia
   c. to counteract the tachycardia associated with ketamine
   d. to counteract the muscle rigidity associated with ketamine
   e. to decrease the tissue irritation associated with intramuscular or intravenous administration of ketamine

2. Golden retrievers, Newfoundlands, German shepherds, and boxers are predisposed to:
   a. tricuspid dysplasia
   b. subaortic stenosis
   c. patent ductus arteriosus
   d. valvular pulmonic stenosis
   e. mitral insufficiency

3. The nonregenerative anemia that accompanies chronic renal failure is caused by:
   a. chronic blood loss
   b. erythropoietin deficiency
   c. erythrophagocytosis
   d. elevated blood urea nitrogen
   e. hypoparathyroidism

4. Which disorder is LEAST likely to cause epistaxis?
   a. nasal neoplasia
   b. blastomycosis
   c. *Ehrlichia canis* infection
   d. polycythemia
   e. canine distemper

5. For the past several years you have been treating a diabetic dog with insulin. The dog now develops hyperadrenocorticism and you institute mitotane (Lysodren) therapy. How will this new development likely affect the regimen of insulin treatment?
   a. Insulin requirement will remain the same.
   b. Insulin requirement will most likely decrease with time.
   c. Insulin requirement will most likely increase with time.
   d. Insulin therapy will be discontinued during mitotane therapy because of possible toxicity from drug interaction.
   e. Insulin will be changed from long-acting insulin to shorter-acting insulin.

1. Quelle est la principale raison d’utiliser le diazépam en combinaison avec la kétamine chez le chat?
   a. pour neutraliser la salivation provoquée par la kétamine;
   b. pour fournir une analgésie supplémentaire;
   c. pour neutraliser la tachycardie due à la kétamine;
   d. pour neutraliser la rigidité musculaire due à la kétamine;
   e. pour diminuer l’irritation tissulaire associée à l’administration intramusculaire ou intraveineuse de la kétamine.

2. Le Golden retriever, le Terre-Neuve, le Berger allemand et le Boxer sont des races prédisposées à :
   a. la dysplasie tricuspide;
   b. la sténose subaortique;
   c. la persistance du canal artériel;
   d. la sténose de la valve pulmonaire;
   e. l’insuffisance mitrale.

3. L’anémie non régénérative qui accompagne l’insuffisance rénale chronique est causée par :
   a. une perte de sang chronique;
   b. une carence en érythropoïétine;
   c. l’érythrophagocytose;
   d. une augmentation de l’azote uréique du sang;
   e. l’hypoparathyroïdisme.

4. Lequel des problèmes suivants est LE MOINS susceptible de causer de l’épistaxis?
   a. néoplasie nasale;
   b. blastomycose;
   c. infection à *Ehrlichia canis*;
   d. polycythémie;
   e. distemper canin.

5. Depuis plusieurs années vous traitez un chien diabétique à l’insuline. Le chien souffre maintenant d’hypéradrénocorticisme et vous instaurez un traitement au mitotane (Lysodren). Comment ce nouveau traitement affectera-t-il probablement le traitement à l’insuline?
   a. Le besoin en insuline demeurerait le même.
   b. Le besoin en insuline diminuerait probablement avec le temps.
   c. Le besoin en insuline augmenterait probablement avec le temps.
   d. Le traitement à l’insuline devra être arrêté durant le traitement au mitotane à cause de la possibilité d’intoxication due à l’interaction médicamenteuse.
   e. L’insuline à longue durée d’action devra être changée pour une insuline à courte durée d’action.
6. Of the following antibacterials, which is the best choice for perioperative use in a cat with pyometra?
   a. erythromycin
   b. metronidazole
   c. tetracycline
   d. cefoxitin
   e. clindamycin

7. In horses, cystorrhaphy is the surgical technique of choice for management of:
   a. urolithiasis
   b. patent urachus
   c. transitional-cell carcinoma
   d. ruptured bladder
   e. ectopic ureter

8. You are asked to investigate a widespread outbreak of upper respiratory tract diseases at the local race track. Affected horses have a high fever for 2 days, a serous nasal discharge, cough, and lethargy. You suspect equine influenza. Which test would confirm your tentative diagnosis?
   a. anaerobic culture of a transtracheal aspirate
   b. 4-fold increases in influenza antibody over a 2-week period
   c. an interstitial lung pattern on thoracic radiographs
   d. response to acyclovir, an antiviral drug
   e. endoscopic evidence of tracheitis and pharyngitis

9. A plasma fibrinogen concentration of 10 g/L in a cow is most indicative of:
   a. multiple myeloma
   b. lymphosarcoma
   c. chronic liver disease
   d. peracute inflammation
   e. chronic inflammatory disease

10. An aged cow has caudal ataxia, several palpable masses in the intermandibular and parotid area, and an irregular heart rate. The most likely cause of these findings is:
    a. tuberculosis
    b. lymphosarcoma
    c. listeriosis
    d. parotid-gland carcinoma with metastasis
    e. endocarditis, with disseminated abscesses

   (See p. 144 for answers./Voir les réponses à la page 144.)
From the CVMA Council Table

The CVMA Council met on November 24–25, 2012, in Ottawa, to make policy decisions with a focus on the CVMA’s 2013 Program Plan and Budget. Council welcomed the following new members on board, Emily Vellekoop (representing all student veterinarians of Canada), Dr. Berney Pukay, representing all CVMA members in Ontario, and Ms. Michelle Moroz, representing the Canadian Association of Animal Health Technologists and Technicians (CAAHTT) in an ex-officio, non-voting capacity. The CVMA would like to thank Ms. Crystal Riczu, past-SCVMA president, for her active involvement at the Council table.

CVMA Council members are as follows:

Dr. James Fairles, president
Dr. Jim Berry (New Brunswick), president-elect
Dr. Jean Gauvin (Quebec), vice-president
Dr. Nicole Gallant (Prince Edward Island), executive member
Dr. Lloyd Keddie, immediate past-president
Dr. Barry Stemshorn (ex-officio), treasurer
Mr. Jost am Rhyn (ex-officio), executive director
Dr. Robert Ashburner (British Columbia)

De la table du Conseil de l’ACMV


Les membres du Conseil de l’ACMV sont les suivants :

D’r James Fairles, président
D’r Jim Berry (Nouveau-Brunswick), président désigné
D’r Jean Gauvin (Québec), vice-président
D’r Nicole Gallant (Île-du-Prince-Édouard), membre de l’exécutif
D’r Lloyd Keddie, président sortant
D’r Barry Stemshorn (membre d’office), trésorier
Some Highlights from the Council Table

For many years now, as the voice of Canadian veterinarians in national and international veterinary issues, the CVMA has maintained and further developed collaboration with a large number of stakeholder groups, including government, national and international organizations.

During its meeting, Council met formally with Mr. George Da Pont, Canadian Food Inspection Agency (CFIA) president and executive director, Animal Health Directorate, and Canada’s new Chief Veterinary Officer, Dr. Ian Alexander. Mr. Da Pont and Dr. Alexander provided updates from the CFIA on key aspects such as animal welfare, humane transportation, slaughter and modernizing the legislative framework. In addition, Council met with the director general of Health Canada’s Veterinary Drugs Directorate (VDD), Mr. Daniel Chaput, who presented updates on the VDD’s workload, collaboration with the United States related to the drug approval process, and regulatory modernization. Council discussed with Mr. Chaput such matters as the status of Own Use Importation (OUI), Minor Use/Minor Species (MUMS), veterinary natural health products and the use of Beta-agonists in food-animals.

Partnership with Regulatory Bodies

In the fall of 2011 and in early 2012 the CVMA conducted a series of meetings with the Councils of all regulatory bodies to discuss collaboration of the services provided by CVMA to the profession at large, as well as to the general public. Such services include leadership on animal welfare and national issues. These meetings lead to a request for a formal CVMA proposal. The latter was submitted to the regulatory bodies for feedback, which was duly provided to the CVMA.

Ms. Michele Moroz (ex-officio), CAAHTT
Ms. Emily Vellekoop, SCVMA President

Some Highlights from the Council Table

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Mr. George Da Pont (left) and Dr. Ian Alexander.

M. George Da Pont (à gauche) et le Dr Ian Alexander.
On July 12, 2012, during the CVMA Convention, CVMA Council met with all regulatory body presidents and registrars to discuss areas of consensus for collaboration. As a next step, regulatory bodies and Council members established a Task Force consisting of Dr. Joel Bergeron (chair), Drs. Andrew Peacock, Duane Landals, Jim Berry and Lloyd Keddie. The mandate of the Task Force is to analyze the outcome of the July meeting and the previous feedback received and to develop a “next generation proposal” for consideration by all regulatory bodies and the CVMA. Since then, the Task Force has held a number of teleconferences, undertook further consultations with the regulatory bodies and is working on options for consideration.

**Canadian Veterinary Reserve (CVR)**

On October 11, 2012, the CVMA entered into a 3-year CVR funding agreement with the CFIA. The government contribution to this CVMA program is exclusively for foreign animal disease emergency preparedness. Given the absence of funding for civil emergency preparedness, the CVMA is looking at alternatives for maintaining the civil emergency preparedness of reservists, such as existing online courses, in-person training, and participation in national and provincial exercises. The CVR currently consists of 474 members, of whom 245 have been trained.

**National Issues**

**Complementary and Alternative Veterinary Medicine:** Council approved the following revised position statement:

“The Canadian Veterinary Medical Association (CVMA) believes that the use of alternative and complementary therapies on animals, including the prescription and administration of natural and homeopathic products, constitutes the practice of veterinary medicine. The Association also holds that these therapies should only be offered in the context of a valid veterinary/client/patient relationship and that informed client consent must be obtained. Clients should be informed of conventional diagnostic and therapeutic options that are applicable and available. The CVMA also believes that it is incumbent upon veterinarians who use alternative and complementary therapies to become adequately trained in their application.”

**Prudent Use Guidelines:** The Companion Animal Prudent Use Guidelines are under development. The CVMA Working Group has completed the general principles and the urinary tract infection section. Work has begun on the canine pyoderma section. The adaptation of the Guidelines into a Web application for tablets and smartphones is being planned.

**Animal Welfare**

**Castration of Horses, Donkeys, and Mules:** Council approved the following revised position statement:

“The Canadian Veterinary Medical Association (CVMA) regards castration of horses, donkeys, and mules as a veterinary medical procedure that should only be performed by a veterinarian, using appropriate surgical, anesthetic and analgesic techniques. Castration of horses, donkeys and mules is an elective procedure involving significant risk to the animal. The CVMA encourages provincial regulatory authorities to regard castration of horses, donkeys and mules as an act of veterinary practice and regulate...”

ont formé un Groupe de travail composé du D’ Joël Bergeron (président) ainsi que des D’ Andrew Peacock, Duane Landals, Jim Berry et Lloyd Keddie. Le mandat du Groupe du travail consiste à analyser les résultats de la réunion de juillet et la rétroaction antérieure reçue et à élaborer une «proposition de génération suivante» aux fins de considération par tous les organismes de réglementation et l’ACMV. Depuis ce temps, le Groupe de travail a tenu plusieurs téléconférences, entrepris de nouvelles consultations auprès des organismes de réglementation et il travaille maintenant à la mise au point d’options aux fins de considération.

**Réserve vétérinaire canadienne (RVC)**

Le 11 octobre 2012, l’ACMV a conclu une entente de financement de trois ans de la RVC avec l’ACIA. La contribution du gouvernement à ce programme de l’ACMV vise exclusivement la planification des mesures d’urgence liées aux maladies animales exotiques. Compte tenu de l’absence de financement pour les mesures d’urgence relatives aux urgences civiles, l’ACMV est à la recherche d’options de rechange pour maintenir l’état de disponibilité opérationnelle des réservistes relativement aux urgences civiles, comme des cours en ligne existants, une formation en personne et la participation à des exercices nationaux et provinciaux. La RVC se compose actuellement de 474 membres, dont 245 ont été formés.

**Enjeux nationaux**

**Médecine vétérinaire complémentaire et parallèle :** Le Conseil a approuvé l’énoncé de position révisé suivant :

«L’Association canadienne des médecins vétérinaires (ACMV) estime que le recours aux traitements parallèles et complémentaires pour soigner des animaux, y compris la prescription et l’administration de produits naturels et homéopathiques, est conforme à l’exercice de la médecine vétérinaire. L’Association croit aussi que ces traitements ne devraient être dispensés que dans le cadre d’une relation vétérinaire-client-patient et que le consentement éclairé du client est essentiel. Le client doit être informé des procédés diagnostiques et thérapeutiques conventionnels pertinents qui existent. En outre, l’ACMV croit qu’il incombe aux vétérinaires qui ont recours à des traitements parallèles et complémentaires d’acquérir une formation appropriée dans ce domaine.»

**Lignes directrices sur l’administration judiciaire :** Les lignes directrices sur l’administration judiciaire des antimicrobiens aux animaux de compagnie est actuellement en cours de rédaction. Le Groupe de travail de l’ACMV a terminé les principes généraux et la section sur les infections urinaires. On a entamé les travaux sur la section de la pyodermie canine. L’adaptation des lignes directrices pour une application Web destinée aux tablettes et aux téléphones intelligents est en voie de planification.

**Bien-être des animaux**

**Castration des chevaux, des ânes et des mulets :** Le Conseil a approuvé l’énoncé de position révisé suivant :

«L’Association canadienne des médecins vétérinaires (ACMV) considère la castration des chevaux, des ânes et des mulets comme une intervention qui devrait seulement être réalisée par un
accordingly. Furthermore, the failure to provide surgical anesthesia during equine castration would cause avoidable animal suffering.”

**Capture of Wild Animals for the Pet Trade:** Council approved the following revised position statement:

“The Canadian Veterinary Medical Association (CVMA) is opposed to the capture of wild animals to be kept or sold as pets.”

**Business Management**

The 2012 CVMA economic survey was conducted in all provinces and the CVMA’s Provincial Economic reports have been posted on the CVMA Web site, under the “Economic Hub.” The CVMA Provincial Fee Guides are scheduled for release in January 2013. The Associate Compensation Reports were posted in August 2012.

The “Clinic Team Track” of the CVMA’s 2013 Convention (July 10) will include workshops on Feline Practice Building with Dr. Margie Scherk and on Understanding Client Satisfaction and How to Measure it with Dr. Rob Rogers.

**Communications**

With his President’s Message in the September 2012 issue of The Canadian Veterinary Journal (The CVJ), the CVMA president, Dr. Jim Fairles, shared his thoughts on the importance of communication and how it applies to the CVMA. The CVMA is communicating and engaging with its members through The CVJ, the Online from 339 newsletter, its members’ Web site, a Facebook page for members, one for Students and one for Emerging Leaders, Twitter, e-blasts, and the annual CVMA Source Guide. The communications needs of our members and stakeholders are evolving and the CVMA is required to adapt constantly in order to deliver pertinent and easily accessible information. Council is considering the undertaking of a “Communications Audit,” resulting in a renewed CVMA communications strategy with its members and the public. As part of this process, the CVMA’s 2013 strategic planning session will focus on communications as well.

**SCVMA Student Symposium**

The 2013 SCVMA Student Symposium took place on January 10 to 12, 2013 in Charlottetown, Prince Edward Island, at the Atlantic Veterinary College (AVC). The students will be offered 2 full days of clinical presentations, wet labs and lectures.

**CVMA Emerging Leaders Program**

Contingent upon 3rd party co-funding, the CVMA will offer an Emerging Leaders Program again in 2013 on Wednesday, July 10 in conjunction with the CVMA Convention in Victoria, British Columbia. This program will be chaired by Dr. Melodie Chan.

**2013 CVMA Summit of Veterinary Leaders**

The Summit of Veterinary Leaders will also take place on Wednesday, July 10, 2013 in Victoria. The CVMA’s president-elect, Dr. Jim Berry will be preparing and chairing this event, which will focus on animal welfare in practice. The leaders in the veterinary profession and all CVMA members are invited to attend.

vétérinaire, en utilisant des techniques chirurgicales, anesthésiques et analgésiques appropriées. La castration des chevaux, des ânes et des mulets est une intervention non urgente comportant un risque considérable pour l’animal. L’ACMV encourage les autorités réglementaires provinciales à considérer la castration des chevaux, des ânes et des mulets comme une intervention vétérinaire et à établir des règlements en conséquence. En outre, une castration équine sans anesthésie est considérée comme un acte de cruauté envers les animaux.”

**Capture d’animaux sauvages pour le commerce d’animaux de compagnie :** Le Conseil a approuvé l’énoncé de position révisé suivant :

«L’Association canadienne des médecins vétérinaires (ACMV) s’oppose à la capture des animaux sauvages en vue d’en faire des animaux de compagnie ou de les vendre comme tels.»

**Gestion commerciale**


Le «Volet de l’équipe de la clinique» du congrès 2013 de l’ACMV (10 juillet) inclura des ateliers sur l’établissement d’une pratique féline avec la Dʳ Margie Scherk et sur la compréhension de la satisfaction de la cliente et la façon de la mesurer avec le Dʳ Rob Rogers.

**Communications**

Dans son Mot du président du numéro de septembre 2012 de La Revue vétérinaire canadienne (La RVC), le président de l’ACMV, le Dʳ Jim Fairles, a communiqué sa pensée sur l’importance de la communication et ses ramifications pour l’ACMV. L’ACMV communique avec ses membres et les invite à la participation par l’entremise de La RVC, du bulletin En direct du 339, du site Web des membres, d’une page Facebook pour les membres ainsi que de celles pour les étudiants et les futurs leaders, des envois par courriel et du Guide de ressources annuel de l’ACMV. Les besoins de communication de nos membres et de nos intervenants évoluent et l’ACMV doit s’adapter constamment afin d’offrir de l’information pertinente et facilement accessible. Le Conseil considère la réalisation d’un «audit des communications» qui donnera lieu à un renouvellement de la stratégie de communication de l’ACMV avec ses membres et le public. Dans le cadre de ce processus, les séances de planification stratégique 2013 de l’ACMV porteront aussi sur les communications.

**Symposium étudiant des ÉACMV**

Le Symposium étudiant 2013 des ÉACMV s’est déroulé du 10 au 12 janvier 2013 à Charlottetown (Île-du-Prince-Édouard) à l’Atlantic Veterinary College (AVC). Les étudiants ont pu assister à deux journées complètes de présentations cliniques, de laboratoires de travaux pratiques et de conférences.
Code of Ethics/Professional Code of Conduct

Council mandated Dr. Troy Bourque to form and lead a task force developing a code for Council’s consideration.

Member Wellness

Following a survey on member wellness, Dr. Jim Fairles organized and chaired the 2012 CVMA Summit of Veterinary Leaders entitled “Member Wellness — the Art of Maintaining your Sanity.” At the Council meeting, Dr. Fairles referred to the outcome of the survey and the Summit and the importance of addressing this challenge.

Currently, the CVMA has put together an overview of helpful and support services provided in the provinces and available on its member Web site. Also on the Web site is a “Burnout Self-Test” (Maslach Burnout Inventory). The CVMA Insurance Program offers support services under the CVMA/Total Guard Employee Benefits Plan with long-term disability coverage. In 2013, Dr. Lisa Miller will contribute a new column in The CVJ on the issue of member wellness. Drs. Jim Fairles and Lisa Miller also represent the CVMA on a newly formed International Veterinary Professional Wellbeing Group that will focus on the delivery of support/interventions and will facilitate the sharing of experience, models and tools.

Council appointed a task force consisting of Drs. Jim Fairles, Berney Pukay and Diane Frank and will invite Dr. Lisa Miller to join as well. The focus of this task force will be on awareness and prevention.

Savings for CVMA members

The CVMA Insurance Program provides significant financial benefits to CVMA members. The number of both commercial and employee benefit insurance policies increased over the past 12 months by 14%. The CVMA commercial liability insurance offers a minimum 10% reduction of the current premium for equivalent or superior coverage.

Some Council members shared their experience of saving money by using the new CVMA hotel discount program, with savings of up to 50%. This program offers rates that average between 5% and 20% better than other online hotel booking services. The new car rental discounts and benefits with National Car Rental and Enterprise Rent-A-Car provides for a 10% discount.

International Summit for Urban Animal Strategies

The CVMA has represented the veterinary profession in this annual event for several years. The Care for Cats campaign was one of the outcomes of this Summit in which representatives from shelters, Societies for the Prevention of Cruelty to Animals, Humane Societies, the Pet Industry Joint Advisory Council of Canada, breeders, municipalities and veterinarians collaborate.

In 2013, Regional Summits for Urban Animal Strategies will be held in Toronto, Ontario (April 17), Halifax, Nova Scotia (April 18), Red Deer, Alberta (April 22) and Vancouver, British Columbia (April 23). CVMA Council members will represent the profession at these regional conferences, which are designed to bring stakeholders together to work collaboratively on urban animal strategies. Veterinarians can register for these conferences (www.tsuas.com/2013RSUAS).

Programme des futurs leaders de l’ACMV

Sous réserve d’un cofinancement par des tiers, l’ACMV offrira un Programme des futurs leaders de nouveau en 2013, soit le mercredi 10 juillet pendant le congrès de l’ACMV à Victoria, en Colombie-Britannique. Ce programme sera présidé par la Dʳ Melodie Chan.

Sommet des leaders vétérinaires 2013 de l’ACMV

Le Sommet des leaders vétérinaires se déroulera aussi le mercredi 10 juillet 2013 à Victoria. Le président désigné de l’ACMV, le Dr’ Jim Berry planifiera et présidera cette activité, qui portera sur le bien-être des animaux en pratique. Les leaders de la profession vétérinaire et tous les membres de l’ACMV sont invités à y assister.

Code d’éthique et de conduite professionnelle

Le Conseil a mandaté le Dr’ Troy Bourque pour former et diriger un groupe de travail en vue de l’élaboration d’un code aux fins de considération par le Conseil.

Bien-être des membres

Après une enquête réalisée sur le bien-être des membres, le Dr’ Jim Fairles a organisé et présidé le Sommet des leaders vétérinaires 2012 de l’ACMV intitulé «Bien-être des membres — Moyens pour rester sain d’esprit». À la réunion du Conseil, le Dr’ Fairles a mentionné les résultats de l’enquête et du Sommet et l’importance de relever ce défi.


Le Conseil a nommé un groupe de travail composé des Dʳ Jim Fairles, Berney Pukay et Diane Frank et il invitera aussi la Dʳ Lisa Miller à se joindre au groupe. Le mandat de ce groupe de travail sera la sensibilisation et la prévention.

Économies pour les membres de l’ACMV

Le Programme d’assurance de l’ACMV offre des avantages financiers considérables aux membres de l’ACMV. Le nombre de polices d’assurance commerciale et d’avantages sociaux pour les employés a connu une augmentation de 14 % au cours des douze derniers mois. L’assurance de responsabilité commerciale de l’ACMV offre une réduction minimale de 10 % sur la prime actuelle pour une couverture équivalente ou supérieure.

Certains membres du Conseil ont partagé leur expérience relativement aux économies réalisées grâce au nouveau programme de rabais hôteliers de l’ACMV qui leur a permis
CVMA — SBCV Chapter
Since 2011, the CVMA and the Society of British Columbia Veterinarians (SBCV) have collaborated in providing services to British Columbia members. The CVMA-SBCV Chapter is focusing its services on provincial matters such as continuing education, provincial advocacy and the West Coast Veterinarian Magazine. The CVMA provides all of the national services to veterinarians in British Columbia. By avoiding duplication and promoting dual membership, the provincial and national services can be offered jointly to members at an advantageous membership fee.

CVMA Convention, July 10 to July 13, 2013, Victoria, British Columbia — in partnership with the CVMA-SBCV Chapter and in collaboration with CAAHTT
The CVMA Convention provides Canadian veterinarians from coast to coast with the opportunity to meet annually. In keeping with the CVMA's goals, the Convention will once again feature top-notch national and international speakers. The large number of speakers (approximately 36) demonstrates the large variety being offered. The continuing education will consist of 9 small animal streams, 3 bovine streams, 3 equine streams, 6 hours of animal welfare and 6 hours of business management sessions and 2 labs, namely "Feline Extraction and Subgingival Crown Amputations" and "Radiology Master Class" (small animal).

Appointments of Committees and Representatives
At its November meeting, CVMA Council appointed Committee members and representatives with external agencies for the 2013 one-year term. Council would like to thank all veterinarians who volunteer their expertise and time for the good of their profession.

d’obtenir des réductions pouvant atteindre jusqu’à 50 %. Ce programme offre des tarifs procurant des réductions moyennes de 5 % à 20 % par rapport aux autres services de réservation en ligne d’hôtels. Les nouveaux rabais et avantages de location de voitures avec National et Enterprise offrent un rabais de 10 %.

Sommet international sur les stratégies pour les animaux urbains
Depuis plusieurs années, l’ACMV représente la profession vétérinaire à cet événement. La campagne Soins des chats a été l’un des résultats de ce Sommet où les représentants des refuges, des Sociétés pour la prévention de la cruauté envers les animaux, du PJIAC (Pet Industry Joint Advisory Council of Canada), des éleveurs, des municipalités et des vétérinaires travaillent en collaboration.

En 2013, des Sommets régionaux sur les stratégies pour les animaux urbains se tiendront le 17 avril à Toronto (Ontario), le 18 avril à Halifax (Nouvelle-Écosse), le 22 avril à Red Deer (Alberta) et le 23 avril à Vancouver (Colombie-Britannique). Les membres du Conseil de l’ACMV représenteront la profession à ces conférences régionales qui sont conçues pour réunir les intervenants et leur permettre de travailler de concert à des stratégies pour les animaux urbains. Les vétérinaires peuvent s’inscrire à ces conférences (www.tsuas.com/2013RSUAS).

Section ACMV-SBCV
Depuis 2011, l’ACMV et la Society of British Columbia Veterinarians (SBCV) ont collaboré pour la prestation de services aux membres de la Colombie-Britannique. La Section ACMV-SBCV offre des services à l’échelle provinciale, comme la formation continue, la défense des intérêts provinciaux et le magazine West Coast Veterinarian Magazine. L’ACMV fournit tous les services nationaux aux vétérinaires de la Colombie-Britannique. En évitant le dédoublement des services et en faisant la promotion de l’adhésion aux deux associations, les services provinciaux et nationaux peuvent être offerts conjointement aux membres à une cotisation avantageuse.

Congrès de l’ACMV, du 10 au 13 juillet 2013, Victoria (Colombie-Britannique) — en partenariat avec la Section ACMV-SBCV et en collaboration avec l’ACTTSA
Le congrès de l’ACMV offre l’occasion aux vétérinaires canadiens d’un océan à l’autre de se rencontrer une fois par année. Conformément aux objectifs de l’ACMV, le congrès présentera de nouveau des conférenciers nationaux et internationaux de calibre supérieur. Le grand nombre de conférenciers (environ 36) démontre le vaste choix offert. La formation continue se composera de neuf volets pour les petits animaux, de trois volets bovins, de trois volets équins, de six heures de bien-être animal et de six heures d’ateliers sur la gestion commerciale et de deux laboratoires, notamment «Extraction feline et amputations de couronnes sous-gingivales» et «Classe de maître sur la radiologie» (petits animaux).

Nominations des membres des comités et des représentants
À sa réunion de novembre, le Conseil de l’ACMV a nommé les membres des comités et les représentants auprès des agences externes pour un mandat d’un an en 2013. Le Conseil aimerait remercier tous les vétérinaires qui contribuent leur expertise et donnent de leur temps pour le bien de la profession.
Animal Health Technology/Veterinary Technician Program
Accreditation Committee
Comité d’agrément des programmes de technologie en santé animale et de techniques vétérinaires
Dr./Dr Glen Jackson, Chair/Président
Dr./Dr Dana Allen
Dr./Dr Bruce Grahn
Dr./Dr Tim Zaharchuk
Dr./Dr Patricia Turner

Animal Welfare Committee
Comité sur le bien-être des animaux
Dr./Dr T erri Chotowetz
Dr./Dr Debbie Haines
Dr./Dr Dana Allen
Dr./Dr Dana Allen
Dr./Dr Bruce Grahn
Dr./Dr Tim Zaharchuk
Dr./Dr Troy McPherson, Council liaison/Liaison avec le Conseil

National Issues Committee
Comité sur les enjeux nationaux
Dr./Dre T erri Chotowetz
Dr./Dr Dana Allen

Professional Development Committee
Comité de perfectionnement professionnel
Dr./Dr Dana Allen, Chair/Président
Dr./Dre Robert Coppock, Chair/Présidente
Dr./Dre Jean Gauvin, Council Liaison/Liaison avec le Conseil
Dr./Dre Robert Nixon

Ex-officio/Membres d’office
Dr./Dr Gordon Doonan (CAAV/ACIA)
Dr./Dre Gilly Griffin (CCAC/CCPA)
Ms./Mme Barb Cartwright (CFHS/FSCAA)
Dr./Dre Tim Zahrachuk (OVMA)

Business Management Committee
Comité de la gestion commerciale
Dr./Dre Robert Bellamy, Chair/Président
Dr./Dr Frank Richardson
Dr./Dre Odette Girard
Dr./Dre Crystal Craig
Ms./Mme Karen Clifford
Dr./Dre Brent Humphrey, Chair/Président
Dr./Dre Robert Nixon
Dr./Dre Angie Runnalls
Dr./Dre Joanne Dias
Dr./Dre Jean Gauvin, Council Liaison/Liaison avec le Conseil
Dr./Dre Kevin Miller, Council Liaison/Liaison avec le Conseil

Dr./Dre Susan MCTaggart, Chair 2013/Présidente 2013
Dr./Dre Rob Ashburner
Dr./Dre Heather Hilier, Chair 2014/Présidente 2014
Dr./Dre Diane Frank, Council Liaison/Liaison avec le Conseil
Dr./Dre Ron Dunphy, Council Liaison/Liaison avec le Conseil

Ex-officio/Membres d’office
Ms./Mme Roberta Rouse, AHT, CAAHTT/AHT, ACTTSA
Ms./Mme Lisa Skentelbury, AHT, CAAHTT/AHT, ACTTSA
Ms./Mme Karen Clifford

Students of the CVMA (SCVMA)
Étudiants de l’ACVM (ÉACVM)
Ms./Mme Emily Vellekoop (OVC), President/Présidente
Ms./Mme Katelyn McIntyre (WCVM)
Ms./Mme Jessica Rock (AVC)
Mr./M. Alex Terreros (FMV)
Ms./Mme Eiry Spence (UCVM)

Communications Advisory Group
Groupe consultatif des communications
Dr./Dre Jean Gauvin, Chair/Président
Dr./Dre Jayne Takahashi
Dr./Dre Anne-Marie Malard-Russ
Dr./Dre Wayne Hollingshead
Dr./Dre Berney Pukay

Environment Advisory Group
Groupe consultatif environnemental
Dr./Dre Robert Copock, Chair/Présidente
Dr./Dre Madelaine Hill
Dr./Dre Craig Stepehn (Ex-officio/Membre d’office)

CVMA Insurance Advisory Group
Groupe consultatif du programme d’assurance
VACANCY/VACANT

Student Liaison Advisory Group
Groupe consultatif de liaison avec les étudiants
Dr./Dre Spencer Greenwood (AVC), Chair/Président
Dr./Dre Diane Frank (FMV)
Dr./Dre Gordon Krebs (UCVM)
Dr./Dre Peter Conlon (OVC)
Dr./Dre Trisha Dowling (WCVM)
LIST OF 2013 REPRESENTATIVES WITH EXTERNAL AGENCIES
LISTE DES RÉPRÉSENTANTS 2013 AUPRÈS DES AGENCES EXTERNES

Aquatic Animal Health Consultative Committee of CFIA’s National Aquatic Animal Health Program
Comité consultatif sur la santé des animaux aquatiques du Programme national de la santé des animaux aquatiques de l’ACIA : Drs./Drs Larry Hammell and/et Grace Karreman

Atlantic Veterinary College Advisory Council/Conseil consultatif de l’Atlantic Veterinary College : Dr./Drs Jim Berry

Canadian Animal Health Coalition/Coalition canadienne pour la santé des animaux : Dr./Drs Troy Bourque

The Canadian Association of Animal Health Technologists and Technicians
L’Association canadienne des techniciens et des technologues en santé animale : Dr./Drs Troye McPherson

Canadian Cattle Identification Agency : Dr./Drs Pat Burrage

Canadian Coalition for Public Health in 21st Century
Coalition canadienne pour la santé publique au 21e siècle : Mr./M. Jost am Rhyn

Canadian Council on Animal Care/Conseil canadien de protection des animaux : Dr./Drs Pat Turner

Canadian Kennel Club Foundation/Fondation du Club canin canadien : Dr./Drs R. Jouppi

Canadian Pork Council’s Quality Assurance Program/Programme d’assurance de la qualité du porc : Dr./Drs Daniel Hurnik

Canadian Veterinary Reserve Advisory Board/Conseil consultatif de la Réserve vétérinaire canadienne : Drs./Drs John Drake and/et Gordon Krebs

Commonwealth Veterinary Association : Dr./Drs Keith Campbell

Council on Education : Dr./Drs Baljit Singh

Domestic Group on Emergency Management/Groupe national sur la gestion des urgences : Mr./M. Jost am Rhyn

Educational Commission for Foreign Veterinary Graduates : Dr./Drs Nicole Gallant

Equine Canada/Canada hippique : Dr./Drs Greg Andrews

National Board of Veterinary Medical Examiners : Dr./Drs Jack Wilson

National Companion Animal Coalition/Coalition nationale pour les animaux de compagnie : Dr./Drs Mikiko Shibata

National Farm Animal Care Council/Conseil national pour le soin des animaux d’élevage : Dr./Drs Warren Skippon

PANVET : Dr./Drs Doug Roberts

Pet Nutrition Alliance : Dr./Drs Paul Boutet

Pet Nutrition Alliance’s Non-branded Educational Tools Committee
Comité des outils pédagogiques sans marque de la Pet Nutrition Alliance : Dr./Drs Susan Little

University of Calgary Veterinary Medicine Stakeholder Advisory Council : Dr./Drs Troy Bourque

Health Canada’s VDD — Canadian Animal Health Products Advisory Committee
DMV de Santé Canada — Comité consultatif d’experts sur les produits de santé vétérinaires : Dr./Drs Barry Stemshorn

Health Canada’s VDD — Expert Advisory Committee on Veterinary Natural Health Products
DMV de Santé Canada — Comité consultatif d’experts sur les produits de santé naturels : Dr./Drs Steve Marsden

Western College of Veterinary Medicine Advisory Council: VACANCY/VACANT

WSAVA : Dr./Drs Jim Berry

World Veterinary Association/Association mondiale vétérinaire : Dr./Drs John Drake

XXIIIrd World Veterinary Congress Foundation/Fondation du XXIIIe Congrès mondial vétérinaire : Dr./Drs Conrad L’Écuyer

(by Jost am Rhyn, Executive Director, CVMA/par Jost am Rhyn, directeur général, ACMV)
CVMA’s 65th Annual Convention
July 10–13 Victoria, British Columbia
65e congrès annuel de l’ACMV
Du 10 au 13 juillet à Victoria, en Colombie-Britannique

It’s that time of year again… Time to make plans for attending the CVMA Annual Convention! CVMA’s Professional Development Committee has been working diligently planning the 65th Annual Convention to be held July 10–13, 2013 in Victoria, British Columbia. With the leadership of scientific coordinator Dr. Jeanne Lofstedt and 2013 Convention Chair, Dr. Susan McTaggart, an exciting and rewarding convention is being organized. Take a look at the registration guide (posted online and will be included with March’s CVJ) to discover the high caliber of invited speakers and concurrent sessions that are in the works along with the diverse social and business meetings.

The framework is set for a successful convention, but to truly make it a success, we need you and other veterinarians to register and attend. We know that there are several conferences that veterinarians can choose to attend — provincially and also internationally. However, no other convention in Canada is as large and diversified with the potential of having the greatest influence on your professional career as the CVMA Annual Convention.

One of the most important aspects of the convention is the face-to-face opportunity to meet, connect and bond with other Canadian veterinarians as well as those from other countries. With a gathering of over 600 to 900 delegates, it is also the most convenient and appropriate time for the CVMA to hold its Annual General Meeting and showcase its services, products and value to members. The convention is also a fabulous opportunity for Canadian veterinarians to find out about CVMA’s initiatives and to network with other like-minded professionals.

The 2013 convention features a strong scientific program with 28 speakers from Canada and the United States offering 24 hours of continuing education. Four days’ worth of labs, concurrent streams of instruction exploring companion animal, equine, bovine and animal welfare topics. In addition, each year the Summit of Veterinary Leaders provides a unique opportunity for veterinarians from around the world to discuss and explore the hot issues facing the profession. Then, with such a large gathering of veterinarians, other associations and groups hold business meetings and social events during the convention as well.
It’s not about all work and no play though. The CVMA social evening “Tropical Nights,” to be held in the renowned Crystal Ballroom of the Fairmont Empress hotel, will provide an informal atmosphere for a tropical island theme dinner and later, dance. With over 700 songs in their repertoire, the Commodores Big Band plays classic rock ‘n roll, swing and more. Who knows? We may even see our very own Dr. Sue on the stage playing the trombone.

So take a few moments to look over the registration guide. Make plans to attend this year’s convention in beautiful Victoria and consider booking extra time and stay for a summer vacation.

Go online to register and book your hotel room at the classic Fairmont Empress. You won’t regret you did. Looking forward to meeting you in Victoria!

(by Ruta Klicius, CMP, Convention Manager, CVMA)

Improve the Welfare of Your Companion Animal Patients.

A concise and accessible introduction to animal welfare that is both interesting and valuable in veterinary practice, Animal Welfare in Veterinary Practice describes ways to develop in-practice quality of life assessment, make decisions and turn those decisions into actual welfare outcomes. It reviews available scientific information, legal issues and ethical dilemmas, and relates these to everyday case studies throughout providing a source of evidence-based and practical advice that is directly relevant to the everyday situations of veterinary practice.

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WILEY
Animal Behavior Comportement animal

Repetitive behaviors in cats and dogs: Are they really a sign of obsessive-compulsive disorders (OCD)?

Diane Frank

According to the veterinary literature, a stereotypy is a repetitive, constant behavior that appears to serve no obvious purpose (1). According to the Diagnostic and Statistical Manual of Mental Disorders (DSM) IV-TR, in humans, obsessions are recurrent and persistent thoughts, impulses, or images that are experienced as intrusive and inappropriate, causing marked anxiety and distress (2). Compulsions are repetitive behaviors performed in order to prevent or reduce distress (2). In psychiatry, these obsessions or compulsions cause marked distress, are time-consuming, or significantly interfere with the person’s normal routine, occupational functioning, usual social activities, or relationships. Some veterinary behaviorists do not think that animals can obsess, so rather than talking about obsessive compulsive disorders (OCD), they refer to compulsive disorders (CD) in animals (3). Compulsive disorders (CD) are defined as behaviors usually brought on by conflict but subsequently shown outside the original context. These behaviors seem abnormal because they are displayed out of context and are often repetitive, exaggerated, or sustained.

The term obsessive compulsive disorder was introduced in veterinary medicine in 1991 following a publication by Goldberger and Rapoport (4) in the Journal of the American Animal Hospital Association entitled “Canine acral lick dermatitis: Response to the anti-obsessional drug clomipramine.” These authors included 9 dogs in a single blinded crossover study of clomipramine and desipramine. The latter drug was chosen for comparison because it lacked the anti-obsessional activity of clomipramine but shared the side effect profile seen in humans. All dogs included in the study suffered from severe acral lick dermatitis that had persisted in spite of various treatments. Treatments listed in the article were: Elizabethan collar, allergy shots, Benadryl, neurological analysis, taped paws, Derm caps ES, prednisone, Keflex, steroid shots, Synoptic drops, Valium, antihistamine, flea dips, topical steroids, and Panalog cream. The 13-week study included an initial drug-free period followed by 3 drug phases (clomipramine — desipramine — clomipramine). Three dogs showing no improvement during the first phase (clomipramine) were dropped from the study. Licking based on owner report decreased significantly with clomipramine compared with baseline and with desipramine. However there is no report of actual success rate. The following year Rapaport et al (5), suggested that canine acral lick dermatitis could be an animal model for obsessive-compulsive disorder in humans. Other authors in the human field then published studies using canine acral lick as a model for OCD in humans (6,7). Justification for this model was based on the fact that acral lick dermatitis (ALD) was refractory to previous attempted treatments but improved with psychotropic medicaton: clomipramine, fluoxetine, and sertraline produced 43%, 39%, and 21% decrease from baseline licking in ALD dogs (5). When taking a closer look at attempted treatments, unsuccessful treatments in one study (6) listed local and/or systemic cortisone, iodine ointment, salts, and surgical removal. In the study by Winshank and Berk (7), no specific details were given as to any medical work-up done in the 63 dogs. The term obsessive compulsive disorder then began appearing in the veterinary literature (8). The dogs in 1 veterinary study (8) had been treated with antihistamines, corticosteroids, topical application of corticosteroid creams as well as bandages and Elizabethan collars. The common denominator for all these studies is that dogs had been unresponsive to previous treatments. Most dogs (with the exception of 2 dogs out of 174) never received antibiotics. In the case of 2 dogs that did receive antibiotics, there is no mention of the dosage or duration of the prescription.

MacDonald and Bradley (9) state that infection is almost always present in acral lick dermatitis and that antibiotics are one of the most important treatments for ALD. These agents should be used systematically and therapy may require 4 to 6 mo. A more recent study (10) concludes that “Lesions associated with ALD warrant tissue bacterial cultures as the majority of cases yielded positive growth of bacteria differing from superficial culture and often resistant to empirical drugs.” Current textbooks and dermatology conference notes highlight that ALD should be considered as a primary disease that is complicated by perpetuating factors. Atopy and food allergy as well as secondary deep pyoderma should be at the top of the list of differentials. Also according to a case series (11) “six dogs were presented with acral lick dermatitis-like lesions from different underlying causes, namely lymphoma, an orthopedic pin, deep pyoderma, mast cell tumor, leishmaniasis, and (presumptive) sporotrichosis.”
Following these publications (4–7) that suggested ALD as a model for OCD in humans, the veterinary literature introduced the term OCD or CD as a diagnosis in cats and dogs that exhibited repetitive behaviors. Examples of listed compulsive disorders in dogs include shadow chasing, light chasing, spinning, spinning/tail chasing, acral lick dermatitis (ALD), self-mutilation, fly biting, pica, fence running, flank sucking, checking hind end, and excessive licking of objects (12,13). Examples of listed compulsive disorders in cats include wool or fabric eating, pica, excessive grooming, hyperesthesia, and tail-chasing (12,13).

The case of ALD highlights 2 important points: i) complete medical investigation of ALD dogs that were included in those 5 studies (4–8) was not described and most likely not done; ii) improvement with various psychotropic medications is not sufficient to conclude that ALD is a “behavioral disorder” or an OCD/CD. Perhaps if these dogs had received appropriate medical treatment (for atopy, food allergy, and deep pyoderma), the ALD would have resolved completely.

The veterinary literature states that to be labeled a true CD, the repetitive behavior should occur in the absence of any primary dermatologic, neurologic, or other medical condition. However extensive medical work-up has not been done yet for many of these repetitive behaviors. Data on compulsive disorders in dogs and cats are scarce and incomplete. Generally the publications are reporting outcomes following psychotropic medication and behavior modification recommendations. In several studies various repetitive behaviors are grouped together within 1 publication or are grouped with other anxiety disorders (8,14–16). Often the number of dogs or cats presenting a specific repetitive behavior is low and treatment outcome is not given by type of repetitive behavior. Luescher (3) reported that approximately 2/3 of CD cases improved to the client’s satisfaction. No details, however, are given about improvement (complete resolution versus decreased frequency and/or decreased duration of the repetitive behaviors) or which specific repetitive behavior improved and which ones did not. Unanswered questions include how many and which repetitive behaviors could in fact be nonspecific signs of strictly medical conditions and not an OCD/CD. Studies on “psychogenic alopecia” in cats, repetitive licking of surfaces in dogs, and “fly biting” in dogs are showing that these conditions labeled as OCD/CD are in fact often secondary to medical conditions (17–19). In 1998, Hewson (20) had already written that dogs with repetitive licking behavior (self or objects) were different from other “CD” cases and that this behavior was possibly symptomatic of another condition. The possibility of co-morbid medical and behavioral conditions has not yet been studied in veterinary medicine. One of the major stumbling blocks is the lack of validated anxiety scales for dogs and cats. Other questions that come to mind include whether or not we have the technology and knowledge to identify all underlying medical causes. Is it possible that there might not be a good or affordable way to diagnose an underlying medical problem? Could the medical condition in some cases be difficult to treat (i.e., no good treatment available)?

Now that the term is used widely in veterinary medicine, the major concern is that other repetitive behaviors will be used as models for OCD in humans, without the preliminary complete veterinary medical assessment. An example illustrating this concern is a questionnaire survey study (therefore systematic medical evaluation was most likely not done on dogs prior to inclusion in the study) published in 2012. This study (21) concludes by saying that “the early onset and the variable nature of the repetitive behaviour, which is affected by environmental factors such as micronutrients, neutering and maternal care, share similar components between canine and human compulsions and supports canine tail chasing as a model for human OCD.” This conclusion is worrisome on at least two levels: i) the potential disservice to our patients when veterinarians diagnose animals with a human condition (OCD) without prior studies looking at complete veterinary medical evaluation into causes of the repetitive behavior, and ii) the potential disservice to humans with regards to the validity of results based on a canine model that may not have anything to do with human OCD. Another recent study (22) on response to psychotropic treatment in tail-chasing dogs again illustrates the absence of complete medical evaluation in order to exclude painful conditions, spine/tail abnormalities or other potential medical causes of tail chasing within the study group. The inclusion criteria for these tail-chasing dogs were based strictly on the dog’s behavioral history, clinical signs, and laboratory parameters.

As veterinarians, we have a responsibility to investigate each type of repetitive behavior with a systematic rigorous medical approach prior to reaching a diagnosis of OCD/CD in order to serve our patients and clients better! We probably still have a lot to learn!

References


Descriptive epidemiology of upper respiratory disease and associated risk factors in cats in an animal shelter in coastal western Canada

Nadine Gourkow, James H. Lawson, Sara C. Hamon, Clive J.C. Phillips

Abstract — We examined 250 cats at an animal shelter in the coastal temperate region of Canada to determine whether age, source, gender, and sterilization status influenced risk of shedding at intake, transmission of infection, and development of clinical upper respiratory disease (URD). On admission, 28% of the cats were positive for 1 or more infectious agent related to URD; 21% were carriers of Mycoplasma felis and < 3% were carriers of feline calicivirus (FCV), feline herpesvirus-1 (FHV-1) or Bordetella bronchiseptica. Chlamydia felis and H1N1 influenza virus were not detected. Carrier status was not affected by source, gender, sterilization status, or age (P > 0.05). Viral and bacterial shedding increased by 9% and 11%, respectively, over 3 sampling times (days 1, 4, and 10). Over 40 days after admission, the cumulative probability of developing URD was 2.2 times greater for stray than owner-surrendered cats (P = 0.02) and 0.5 times as great for neutered cats as for intact cats (P = 0.03). Cats that were shedding at intake were 2.6 times more likely to develop URD than were non-carriers (P < 0.002). Cats with FHV-1 and B. bronchiseptica infections were most at risk compared with non-shedding cats (P < 0.01).

Résumé — Épidémiologie descriptive de la maladie respiratoire supérieure et facteurs de risque chez le chat dans un refuge situé dans la côte ouest du Canada. Nous avons examiné 250 chats dans un refuge de la région côtière tempérée du Canada. Nous avons déterminé la présence d’infection latente chez les chats de provenance diverses, par âge, par sexe (castré ou non-castré) lors de leur arrivé au refuge. Nous avons aussi étudié la transmission des pathogènes et le développement de symptômes rhinosinusites pendant leur séjour (40 jours). Au prélèvement du premier écouvillonnage, 21 % était positif pour le Mycoplasme felis (M. Felis) et moins de 3 % était positif pour le calicivirus félin (FCV), l’herpès virus félin de type 1 (FHV1) ou le Bordetella bronchiseptica. Ni Chlamydia felis (C. felis) ni H1N1 n’ont été dépisté. Le nombre de porteurs latents n’était pas affecté par l’origine des chats, le sexe ou l’âge (P > 0.05). La probabilité cumulée de développer des symptômes de maladie était 2,64 fois supérieure pour les porteurs latents que pour les non-porteurs (P < 0.002); 2,21 fois supérieure pour les chats errants que pour les chats de maison (P = 0,02) et 0,5 fois supérieure pour les chats castrés que pour les chats non castré (P = 0,03). En particulier, les porteurs de FHV1 et B. bronchiseptica étaient plus à risque que les chats non-porteurs (P < 0.01). Nous avons conclu que les chats avec une infection latente de FHV1 ou B. Bronchiseptica, les chats errants et les chats castrés étaient plus vulnérables a la maladie des voies respiratoires supérieures dans ce refuge.

(Traduit par les auteurs)

Introduction

Upper respiratory disease (URD) is the primary health issue reported in cats during their stay in animal shelters (1) and post adoption (2,3). In shelters, URD is an important cause of morbidity due in part to poor ventilation, stress-induced immunosuppression, and overcrowding which complicate management of disease (4). Upper respiratory tract disease (URD) is the primary health reason for euthanasia of kittens in animal shelters (5) and cats receiving treatment are subjected to extended periods of confinement with minimal human
interaction (6). Outbreaks of URD are common in animal shelters (7), which together with the day-to-day management of sick cats represent a significant financial burden for humane organizations.

The feline respiratory disease complex involves a variety of pathogens. Feline herpesvirus-1 (FHV-1) and feline calicivirus (FCV) are believed to be responsible for most cases of URD in animal shelters and are followed by Mycoplasma felis, Bordetella bronchiseptica, and Chlamydophila felis (8). In March 2009, a new human influenza A H1N1 virus emerged in Mexico and the United States (9). From fall 2009 to early 2010 in the United States there were several reports of H1N1 influenza virus in animals, 2 of which were owned cats believed to have contracted the virus from their owners (10). Feline herpesvirus-1, which has a prevalence of between 0.2% and 33% in household cats (11) has been reported at rates between 63% and 84% in shelter cats in South Korea (12), Belgium (13), and California, USA (14). Feline calicivirus, which is present in about 8% of household cats (14), is believed to affect about 40% of shelter cats (15). Stray cats admitted to shelters are a known source of these pathogens (16) and there are equivocal results as to whether age, gender, and sterilization status are potential risk factors (14,17,18). However, scientists agree that identifying the characteristics of cats at greater risk for developing URD is critical to the management of the disease in animal shelters (7,19,20).

Despite a substantial body of knowledge on prevalence of URD and associated risk factors in animal shelters worldwide, the epidemiology of URD in Canada, particularly in the coastal temperate climatic region which exists in British Columbia, has not been examined. The Canadian Federation of Humane Societies (21) estimates that there are about 150 Humane Societies/Societies for the Prevention of Cruelty to Animals across Canada, each managing many shelters, in addition to many private rescue organizations and animal control agencies. The present study examined the prevalence of subclinical upper respiratory infections in cats upon admission to an animal shelter, and the risk factors associated with the subsequent spread of infection and development of URD over time.

Materials and methods

The study took place at the Vancouver Branch of the British Columbia Society for the Prevention of Cruelty to Animals (BC SPCA), Canada, between May and November 2010. It was part of a research project to examine emotional and immunological changes in anxious, frustrated, or content cats when provided with behavioral interventions. During the first 10 d of the study, cats were housed in a pre-adoption housing unit with limited access to the public.

Cats were housed individually in stainless steel cages (76 × 76 × 71 cm) furnished with litter boxes, stainless steel food and water bowls, and bedding. Age-appropriate food (Hill’s Pet Nutrition, Mississauga, Ontario) and water was provided twice per day (07:00 h and 17:00 h). Windows provided natural light and temperature was maintained at 20°C ± 2°C. The shelter had 6 separate housing areas with a maximum capacity to house 120 cats. The facility also included an isolation area for sick cats and in-house medical staff at the on-site veterinary hospital.

Table 1. Number of cats that were carriers for FCV, FHV-1, M. felis, and B. bronchiseptica on intake to the shelter

<table>
<thead>
<tr>
<th>Total</th>
<th>FCV %</th>
<th>FHV-1 %</th>
<th>M. felis %</th>
<th>B. bronchiseptica %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>138</td>
<td>5.1%</td>
<td>20.4%</td>
<td>29.6%</td>
</tr>
<tr>
<td>Male</td>
<td>112</td>
<td>2.7%</td>
<td>18.0%</td>
<td>32.2%</td>
</tr>
<tr>
<td>OS</td>
<td>125</td>
<td>2.4%</td>
<td>19.3%</td>
<td>19.2%</td>
</tr>
<tr>
<td>Stray</td>
<td>125</td>
<td>2.2%</td>
<td>20.0%</td>
<td>26.4%</td>
</tr>
<tr>
<td>Fixed</td>
<td>148</td>
<td>1.0%</td>
<td>14.1%</td>
<td>20.8%</td>
</tr>
<tr>
<td>Intact</td>
<td>102</td>
<td>0.9%</td>
<td>8.8%</td>
<td>25.5%</td>
</tr>
<tr>
<td>Juvenile</td>
<td>50</td>
<td>0.0%</td>
<td>5.7%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Adult</td>
<td>134</td>
<td>0.0%</td>
<td>1.4%</td>
<td>9.0%</td>
</tr>
<tr>
<td>Senior</td>
<td>66</td>
<td>0.0%</td>
<td>2.9%</td>
<td>3.3%</td>
</tr>
</tbody>
</table>

Table 2. Prevalence of shedding of various viruses and bacteria from ocular and pharyngeal swabs of shelter cats (N = 250) determined at intake (before vaccination, day 1), at day 4 and at day 10

<table>
<thead>
<tr>
<th>Virus</th>
<th>Day 1</th>
<th>Day 4</th>
<th>Day 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCV</td>
<td>7.0%</td>
<td>6.2%</td>
<td>8.3%</td>
</tr>
<tr>
<td>FHV-1</td>
<td>5.2%</td>
<td>12.5%</td>
<td>23.1%</td>
</tr>
<tr>
<td>M. felis</td>
<td>52.0%</td>
<td>49.2%</td>
<td>61.9%</td>
</tr>
<tr>
<td>C. felis</td>
<td>1.0%</td>
<td>1.0%</td>
<td>3.0%</td>
</tr>
<tr>
<td>B. bronchiseptica</td>
<td>6.2%</td>
<td>6.2%</td>
<td>10.4%</td>
</tr>
<tr>
<td>Viral-All</td>
<td>12.4%</td>
<td>18.7%</td>
<td>31.4%</td>
</tr>
<tr>
<td>Bacterial-All</td>
<td>56.2%</td>
<td>57.2%</td>
<td>74.3%</td>
</tr>
</tbody>
</table>

The shelter followed strict biosecurity measures, including spot cleaning of cages daily (removing debris and wiping cages with a clean cloth dipped in 1% Virkon® solution) and disinfection of cages between cats with a 2% Virkon® solution. Animal care staff did not wear gloves or protective gowns during cleaning of cages but washed their hands with a foaming alcohol handrub (Microsan™ Encore; Deb Product, Waterford, Ontario) following contact with an animal. Cats with observed clinical signs of URD, such as sneezing, were immediately transferred to an isolation ward and received medical care.

Two-hundred and fifty cats that were either surrendered by their owners or brought in as strays by a humane officer were enrolled in the study. Age was provided by the owners or estimated by shelter staff, and categorized as juvenile (6 to 12 mo), adult (1 to 7 y), or senior (> 8 y). Swabs were obtained at intake and subsequently on days 4 and 10. The procedure was carried out by 1 of 3 Registered Animal Health Technicians using polymerase chain reaction (PCR) swabs according to IDEXX procedures. A sterile swab was rolled on the medial conjunctiva and another on the posterior oral-nasal pharynx. The swabs were placed into individual sterile transport tubes (ST RPLEX, Etobicoke, Ontario), refrigerated, and submitted for real-time polymerase chain reaction (RT-PCR) testing within 8 h. After the first swab, cats were vaccinated with a modified live vaccine (Fel-O-Guard® + 3 Boehringer Ingelheim, Burlington, Ontario) and dewormed (Strongid® T; Pfizer, Pointe-Claire, Quebec). Cats with observed clinical signs of URD, gingivitis, or injury
Table 3. Multivariate associations of upper respiratory disease in shelter cats (N = 250) with characteristics and shedding status

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Cats without URD (%)</th>
<th>Cats with URD (%)</th>
<th>Odds ratio</th>
<th>95% Confidence limits for the odds ratio</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>138</td>
<td>96 (70)</td>
<td>42 (30)</td>
<td>1.00</td>
<td>0.70–2.34</td>
<td>0.43</td>
</tr>
<tr>
<td>Male</td>
<td>112</td>
<td>70 (63)</td>
<td>42 (38)</td>
<td>1.28</td>
<td>1.14–4.29</td>
<td>0.02</td>
</tr>
<tr>
<td>Source</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OS</td>
<td>125</td>
<td>88 (70)</td>
<td>37 (30)</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stray</td>
<td>125</td>
<td>78 (62)</td>
<td>47 (38)</td>
<td>2.21</td>
<td>1.42–4.90</td>
<td></td>
</tr>
<tr>
<td>Sterilization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intact</td>
<td>102</td>
<td>75 (74)</td>
<td>27 (26)</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutered</td>
<td>148</td>
<td>91 (61)</td>
<td>57 (39)</td>
<td>0.46</td>
<td>0.23–0.94</td>
<td>0.03</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult</td>
<td>134</td>
<td>94 (70)</td>
<td>40 (30)</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Juvenile</td>
<td>50</td>
<td>34 (68)</td>
<td>16 (32)</td>
<td>1.49</td>
<td>0.67–3.31</td>
<td>0.33</td>
</tr>
<tr>
<td>Senior</td>
<td>66</td>
<td>38 (58)</td>
<td>28 (42)</td>
<td>1.66</td>
<td>0.78–3.55</td>
<td>0.19</td>
</tr>
<tr>
<td>Carrier state</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-carrier</td>
<td>162</td>
<td>125 (77)</td>
<td>37 (23)</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrier</td>
<td>88</td>
<td>41 (47)</td>
<td>47 (53)</td>
<td>2.64</td>
<td>1.42–4.90</td>
<td>&lt; 0.002</td>
</tr>
<tr>
<td>FCV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>181</td>
<td>130 (72)</td>
<td>51 (28)</td>
<td>1.90</td>
<td>0.027–11.69</td>
<td>0.46</td>
</tr>
<tr>
<td>Positive</td>
<td>7</td>
<td>4 (57)</td>
<td>3 (43)</td>
<td>2.23–Inf</td>
<td></td>
<td>0.002</td>
</tr>
<tr>
<td>FHV-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>181</td>
<td>130 (72)</td>
<td>51 (28)</td>
<td>1.29</td>
<td>0.06–Inf</td>
<td>0.27</td>
</tr>
<tr>
<td>Positive</td>
<td>5</td>
<td>0 (0)</td>
<td>5 (100)</td>
<td>Inf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. bronchiseptica</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>181</td>
<td>130 (72)</td>
<td>51 (28)</td>
<td>1.26</td>
<td>1.36–605.27</td>
<td>0.01</td>
</tr>
<tr>
<td>Positive</td>
<td>6</td>
<td>1 (17)</td>
<td>5 (83)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. felis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>181</td>
<td>130 (72)</td>
<td>51 (28)</td>
<td>1.26</td>
<td>0.06–Inf</td>
<td>0.27</td>
</tr>
<tr>
<td>Positive</td>
<td>1</td>
<td>0 (0)</td>
<td>1 (100)</td>
<td>Inf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M. Felis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>181</td>
<td>130 (72)</td>
<td>51 (28)</td>
<td>1.62</td>
<td>0.81–3.20</td>
<td>0.29</td>
</tr>
<tr>
<td>Positive</td>
<td>54</td>
<td>33 (61)</td>
<td>21 (39)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data were analyzed by analysis of covariance, adjusting for the following covariates: gender, source, sterilization status, and age. FCV — Feline calicivirus, FHV-1 — Feline herpes virus-1, B. bronchiseptica — Bordetella bronchiseptica, C. felis — Chlamydophila felis, M. felis — Mycoplasma felis. Inf = infinity.

at admission were not included in the study. Samples were analyzed for FHV-1, FCV, C. felis, M. felis, B. bronchiseptica, and influenza virus H1N1 by RT-PCR assays, that were based on IDEXX’s oligonucleotides and protocols (22). Each test used a fluorescent probe that matched a unique segment of the organism’s DNA or cDNA to ensure high specificity and sensitivity. Real-time PCR was performed with standard primer and probe concentrations using the Roche LightCycler® 480 Probes Master mastermix (Roche Applied Science, Indianapolis, Indiana, USA) and default cycling conditions on a Roche LC480 instrument and 384-well plate configuration.

Statistical analysis
Prevalence of subclinical infections was calculated as the number of cats without clinical signs of URD that were PCR positive for FHV-1, FCV, C. felis, M. felis, or B. bronchiseptica upon admission, divided by all cats in the study (N = 250). Multivariate logistic regression was used to examine the effects on the incidence of URD of gender (male versus female), source [owner-surrendered (OS) versus stray], sterilization status (intact versus neutered), age (juveniles, adults, and seniors), and carrier state (sheding versus not shedding at intake for each specific pathogen). To determine the influence of the individual pathogen (FCV, FHV-1, B. bronchiseptica, C. felis, or M. felis) on the prevalence of URD, an analysis of covariance (ANCOVA) was performed in which the covariates were gender, source, sterilization, and age. These analyses were run on a subset of the 250 cats which included carriers of the particular pathogen and non-carriers of all pathogens (carriers of other pathogens were excluded from the analyses). Cats could be carriers for more than 1 pathogen, so some cats were included in more than 1 analysis. The P-values derived from a model adjusted for all other variables in the model are reported for these analyses.

A Kaplan-Meier survival analysis (23) compared the percentage risk of developing URD by days 7, 14, 21, and > 30 (maximum of 40 d) according to characteristics such as carrier status, age, source, gender, and sterilization status. A Cox regression analysis using the survival package in R statistical
software was used to determine if the risk of contracting URD over time was significantly affected by these characteristics. All analyses were performed with R version 2.10.1. (24).

### Results

**Shedding rate at intake and over time**

At intake, 28% ($n = 69$) of cats were carriers for 1 or more pathogens. Of the positive samples 22%, 2.8%, 2.0%, and 2.4% were positive for *M. felis*, FCV, FHV-1, and *B. bronchiseptica*, respectively. Co-infections with *M. felis* were identified for *B. bronchiseptica* and FCV for 3 and 1 of the samples, respectively. Of the samples obtained at admission, all were negative for *C. felis* and influenza H1N1 virus. Risk of being a carrier was not significantly affected by gender, source, sterilization status, or age (Fisher’s exact test $P > 0.05$) (Table 1). Subsequent swabs (days 4 and 10) showed an increase of 9% and 11% over the 10 d in viral and bacterial infections, respectively. Feline calicivirus (1%), *B. bronchiseptica* (3%), and *C. felis* (1%) showed lower increases than FHV-1 (8%) and *M. felis* (10%) (Table 2). All cats remained negative for influenza H1N1 virus throughout the study.

### Risk factors associated with the development of URD

As shown in Table 3, gender was not a significant factor for the development of URD ($P = 0.43$). Neutered cats had a greater prevalence of URD (39%, $n = 57$) than intact cats (26%, $n = 27$) ($P = 0.03$). When all pathogens were considered together, the risk of developing URD was $2.6 \times$ greater for carriers (53%, $n = 47$) than for non-carriers (23%, $n = 37$) ($P < 0.002$). All FHV-1 carriers (100%, $n = 5$) developed URD compared to cats without subclinical infections (28%, $n = 51$) ($P < 0.002$), whereas the risk was not significantly greater ($P = 0.46$) for FCV carriers (43%, $n = 7$). Although prevalence of *M. felis* shedding (21%, $n = 54$) was greater than for all other pathogens combined, the risk of developing URD was not significantly greater for those cats [odds ratio (OR) = 1.6] ($P = 0.29$). The sample of cats with subclinical *B. bronchiseptica* infection upon admission was small ($n = 6$). However, these cats were significantly more likely to develop URD than were non-carriers ($n = 181$) (OR = 12.6; $P = 0.01$).

**Cumulative risk of developing URD over time**

Cats in the study were at the shelter from 2 to 191 d. The median length of stay before cats exhibited signs of URD, were adopted, redeemed, or euthanized was 14 d. Median times to URD for carriers of FHV-1 and FCV were 6 and 2 d, respectively, compared with 11 d for non-carriers of these 2 viruses. Median time to the development of URD for cats with subclinical *B. bronchiseptica* infection at intake was 8 d compared to 12 d for non-carriers. As shown in Table 4, there was no significant effect of gender or age class on the cumulative risk of developing URD over time. The cumulative risk of developing URD was significantly greater for strays than for OS cats [hazard ratio = 2.46 (1.48 to 4.09), $P = 0.001$]. The likelihood of developing URD was 17% greater for strays than for OS cats after 30 d (Figure 1). Similarly, the cumulative risk of developing URD was greater for neutered than for intact animals [hazard ratio = 0.43 (0.23 to 0.78), $P = 0.01$]. The likelihood for onset of clinical URD was 9% higher for neutered than for intact cats by day 30 (Figure 2). Cats with subclinical infections had the greatest cumulative risk for URD [hazard ratio = 2.39 (1.44 to 3.99), $P < 0.001$] compared with non-carriers. By day 7, 29% of carriers were at risk of developing URD compared to 2.7% for non-carrier cats. By day 14, the risk had increased to 46% for carriers compared with 13% for non-carriers. This trend continued into week 3 with 55% of carriers versus 28% of non-carriers, and beyond 30 d with 76% of carriers versus 41% of non-carriers (Figure 3).

**Discussion**

The primary objective of this study was to determine the risk factors associated with subclinical upper respiratory infections in cats entering a Canadian shelter and those associated with

<table>
<thead>
<tr>
<th>Table 4. Cox Proportional Hazards Models and significance of the survival analysis for each of the demographic characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Male</td>
</tr>
</tbody>
</table>

Source

| **Source** | **N** | **Day 7** | **Day 14** | **Day 21** | **> 30 days** | **Hazard ratio (CI)** | **Pr (>|z|)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| OS | 125 | 7.3 | 19 | 33 | 45 | 1.44 (0.67–2.01) | 0.56 |
| Stray | 125 | 16.3 | 36 | 50 | 61 | 0.48 (0.23–0.78) | 0.01 |

Gender status

| **Gender status** | **N** | **Day 7** | **Day 14** | **Day 21** | **> 30 days** | **Hazard ratio (CI)** | **Pr (>|z|)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Neutered | 148 | 15 | 34 | 45 | 53 | 0.43 (0.23–0.78) | 0.01 |
| Intact | 102 | 7 | 15 | 35 | 44 | 1.73 (1.07–2.78) | 0.02 |

Age

| **Age** | **N** | **Day 7** | **Day 14** | **Day 21** | **> 30 days** | **Hazard ratio (CI)** | **Pr (>|z|)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Adult | 50 | 14 | 22 | 40 | 44 | 0.07 (0.67–2.10) | 0.56 |
| Juvenile | 134 | 19 | 27 | 44 | 63 | 1.85 (0.94–3.64) | 0.07 |
| Senior | 66 | 11 | 30 | 45 | 60 | 1.19 (0.67–2.10) | 0.56 |

Carrier state

| **Carrier state** | **N** | **Day 7** | **Day 14** | **Day 21** | **> 30 days** | **Hazard ratio (CI)** | **Pr (>|z|)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Non-carrier | 162 | 2.7 | 13 | 28 | 41 | 2.39 (1.44–3.99) | < 0.001 |
| Carrier | 88 | 29 | 46 | 55 | 76 | 0.001 (0.23–0.78) | 0.01 |

N — total number; CI — confidence interval.
subsequent onset of clinical URD. The 2.8% shedding rate for FCV in cats entering this shelter was lower than the prevalence of 11% reported in a similar survey in a California shelter (25). Kittens are known to be particularly vulnerable to FCV (26), but our study showed no effect of age on FCV prevalence. In concordance with findings by Pedersen et al (25), FCV infection did not increase over time (1% increase by day 10). In this study, cats were housed singly, thereby minimizing cat-cat transmission of the virus.

Shedding of FHV-1 was also low upon admission (2%). Although shedding of FHV-1 increased over time (8%), prevalence overall was much lower than that reported in a study by Pedersen et al (25) (> 50% after 1 wk). This pathogen may be a particular risk for shelter cats, as latent infections can be reactivated in response to stress and cause recrudescence clinical disease (27). Mycoplasma felis are normal commensal organisms of the upper respiratory tract, but some strains have been implicated in clinical URD in both household (28) and shelter cats (≥ 47%) (29,30). Our findings indicate a high prevalence of M. felis infection upon admission (21%) and showed the largest increase over time (10%) in cats that remained healthy.

Overall, the prevalence of clinical URD in this Canadian shelter (34%) was similar to rates reported in northeastern US shelters (33%) (5) and lower than rates reported in Californian shelters (55%) (14). Carriers (28%), particularly those with FHV or B. bronchi septica infections, were at increased risk for onset of clinical URD. Only 5 cats were FHV-1 positive at intake; however, all developed URD. Similarly, of the 6 cats positive for B. bronchi septica at intake, all but one developed URD. Although co-infections are common with B. bronchi septica, this bacterium alone is capable of inducing respiratory disease (31), which was the case in this study. In a UK study, 19% of cats with URD were positive for B. bronchi septica alone (32). However, an Italian study found more cases of co-infection (42 cases) compared with this bacterium alone (11 cases) (18). In accordance with Bannasch and Foley (14), M. felis was the most prevalent pathogen but was not significantly implicated in the development of URD. Similarly, C. felis is a common pathogen isolated from cats with confirmed conjunctivitis (33); however, it was not prevalent in this shelter. We concur with other authors (34) that this bacterium may not be an important risk factor for shelter cats. The H1N1 influenza virus can be transmitted naturally from humans to cats (35), and can be used to induce experimental infection in cats (36). Although this study was conducted during the human H1N1 pandemic of 2009, no cases were identified nor have any cases been reported in other shelters to date.

Overall, the only infectious agents with significant risk for onset of URD were FHV-1 and B. bronchi septica. A recent study reported no significant difference in prevalence of URD between cats that were PCR positive and cats that were POCR negative for these organisms (37). These authors concluded that URD cannot be controlled by segregation of symptomatic animals due to a lack of strong correlation between subclinical infections and onset of URD. Rather, they recommended similar biosecurity protocols and stress management practices for all cats.

In addition to examination of carrier state as a risk factor, the multivariate analysis included age, gender, sterilization status, and source. Several authors agree that gender is not an important risk factor (14,19), although 1 study identified adult females as a low risk group (5). In our observations, there was no difference between male and female cats; however, neutered cats were at greater risk for URD. Edwards et al (20) found a similar trend, concluding that because most neutered cats were also owner-surrendered, they had likely not been exposed to URD pathogens and were therefore more vulnerable. In our
study, more seniors than adults were neutered, which may explain the association, in accordance with findings that age represents a significant risk factor for the development of clinical URD, with the very young and old being most vulnerable to disease (5,15,20).

In this study, age was not a significant factor; however, inclusion in the study was restricted to cats older than 6 mo and juveniles were poorly represented (n = 50), which may account for the lack of significance. Although shelter staff received training to estimate the age of cats, exact age could not be determined for stray cats which may have introduced some bias. The finding that stray cats were more susceptible to clinical URD than owner-surrendered cats agrees with other authors (38) and may have been influenced by the urban setting (16). According to these authors, the high density of strays in urban settings increases the risk of contracting FCV and FHV-1 infections through social contact between cats (i.e., oral and nasal contact with secretions of infected cats). The most significant risk factor for developing clinical URD in this study was time spent at the shelter. Most authors agree that the risk of developing clinical URD increases with time spent in the shelter (5,25). However, 1 study reported a decline in clinical URD over time, with most signs occurring within 50 d of admission (20). It concluded that cats still at the shelter beyond 50 d were probably resistant to infection. Dinnage et al (5) cautioned against such an interpretation because the number of cats remaining in studies usually decreases over time; therefore, the cumulative probability may be increasingly imprecise.

The prevalences of subclinical infections and clinical URD were low in this shelter, which may be related to its policy of vaccination upon admission (39), placement of cats in quarantine upon admission (8), and good biosecurity (15,30). Although the practice is controversial, the immediate transfer of owner-surrendered cats agrees with other authors (38) and may account for reduced risk factors associated with clinical URD over time. Except for M. felis, prevalence of subclinical infections and subsequent spread of pathogen were less than that observed in shelters from other countries. However, risk factors for URD, such as FHV-1 and B. bronchiseptica infections and stray status, were in accordance with findings in other countries.

Acknowledgments

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References


An investigation of exudative epidermitis (greasy pig disease) and antimicrobial resistance patterns of *Staphylococcus hyicus* and *Staphylococcus aureus* isolated from clinical cases

Jeonghwa Park, Robert M. Friendship, Zvonimir Poljak, J. Scott Weese, Cate E. Dewey

**Abstract** — Exudative epidermitis (EE) is a common skin disease of young pigs, caused mainly by *Staphylococcus hyicus*. Increased prevalence of EE and poor response to treatment are reported. Common strategies used by Ontario pork producers to treat pigs with EE were determined using a survey. Injection of penicillin G was reported as the most common parenteral antibiotic choice. Antimicrobial resistance patterns of *S. hyicus* and *Staphylococcus aureus* isolated from clinical cases (30 herds with samples from approximately 6 pigs per farm) showed that 97% of *S. hyicus* isolates were resistant to penicillin G and ampicillin; 71% of these isolates were resistant to ceftiofur. Similar resistance was noted among *S. aureus* isolates. Antimicrobial resistance has become a problem in the treatment of EE in Ontario.

**Résumé** — Enquête sur l’épidermite exsudative (eczéma séborrhéique du porc) et les tendances d’antibiorésistance de *Staphylococcus hyicus* et de *Staphylococcus aureus* isolés des cas cliniques. L’épidermite exsudative (EE) est une maladie cutanée courante des porcelets qui est causée principalement par *Staphylococcus hyicus*. Une prévalence accrue de EE et une réponse mitigée au traitement sont signalées. Les stratégies couramment utilisées par les producteurs de porcs pour traiter les porcs atteints d’EE ont été déterminées à l’aide d’un sondage. L’injection de pénicilline G a été signalée comme le choix d’antibiotique parentéral le plus courant. Les tendances d’antibiorésistance de *S. hyicus* et de *Staphylococcus aureus* isolés de cas cliniques (30 troupeaux avec des échantillons provenant d’environ 6 porcs par ferme) ont montré que 97 % des isolats de *S. hyicus* étaient résistants à la pénicilline G et à l’ampicilline; 71 % de ces isolats étaient résistants au ceftiofur. Une résistance semblable a été signalée pour les isolats de *S. aureus*. L’antibiorésistance est devenue un problème dans le traitement d’EE en Ontario.

(Traduit par Isabelle Vallières)

**Introduction**

Exudative epidermitis (EE), commonly known as “greasy pig disease” is a generalized or localized skin disease of piglets characterized by exfoliation, sebaceous exudation, and formation of a crust that may cover the entire body (1). The disease is most commonly caused by strains of *Staphylococcus hyicus* that produce exfoliative toxins (2,3). Less frequently, it was reported that the disease can also be caused by toxin-producing strains of *Staphylococcus aureus* and *Staphylococcus chromogenes* (4,5) since some of their staphylococcal exfoliative toxins can cleave the target molecule, swine desmoglein1 (6,7). Exfoliative toxin-producing staphylococci may also penetrate the epidermis directly since the exfoliative toxins cleave cell-to-cell adhesion in mammalian skin and then destroy the barrier function of the skin, with subsequent blister formation (7). Further, damage from biting (particularly newborns with unclipped needle teeth), or from scratches from rough bedding or rubbing against projections on pen walls, can expose the dermis and facilitate the entry of staphylococci, which are commonly present on pigs and in the environment, to start infection (1,8).

The disease occurs worldwide and is a sporadic endemic problem on most farms, but occasionally, major outbreaks involve large numbers of piglets. The recent trend by the swine industry to discontinue the practice of cutting the tips of needle teeth at birth, coupled with the trend of increased litter size, may lead to a rise in the prevalence of EE. There have been anecdotal reports that the disease has become more common and more difficult to treat.

The main objectives of this study were to determine what treatments for EE were being used in Ontario swine, to isolate *S. hyicus* and *S. aureus* from cases of EE, and to determine their antimicrobial resistance profiles.
Materials and methods

Animal use was approved by the University of Guelph Animal Care Committee and was in keeping with Canadian Council of Animal Care Guidelines.

Survey

A survey of pork producers (n = 58) was conducted to obtain information regarding treatment of EE. The researcher completed a questionnaire by interviewing pig farmers who attended a regional trade show (28/58), or alternatively, by interviewing pork producers who participated in a cross-sectional study of farms with cases of EE (30/58). Questions were related to herd type, treatments, and perception of the efficacy of medication, as well as questions about other approaches to control the disease, such as improving hygiene, management changes, and autogenous vaccine use. A survey of swine veterinarians (n = 15) was also conducted in order to obtain their opinions regarding recommendations for treatment and prevention, and whether or not they thought the disease was becoming more difficult to control. The questionnaire was distributed at a regional meeting of Ontario swine veterinarians and was completed during the meeting by all swine veterinarians in attendance. The responding swine veterinarians constituted 53.6% of all Ontario swine veterinarians who practiced in the region (15/28).

Cross-sectional study: Bacterial culture and antimicrobial susceptibility test

Thirty pig farms from southwestern Ontario (Canada) were purposively selected for the study. The inclusion criteria for the cross-sectional study included farms that veterinary practitioners identified as having an outbreak of EE, as well as local farms that were conveniently chosen and identified by the researcher as having pigs with clinical signs of EE. One hundred and eighty-six pigs from the 30 farms were included in the study. An average of 6 pigs per farm (range: 4 to 10) was chosen for sampling. Pigs with localized or systemic clinical signs of EE were chosen. Generally, pigs with the most severe lesions were selected over pigs with mild clinical signs. When large numbers of pigs with clinical disease were present, attempts were made to select from different pens and rooms. However, if only a small number of affected pigs were available, then multiple piglets from the same litter or the same pen were sometimes included. Skin sampling from the facial lesions of pigs affected by EE was accomplished with 1 scraping and 1 swab per pig. Skin scabs from pig facial lesions were scraped into a sterile container by using a melon-baller. The melon-baller was cleaned and disinfected with 70% isopropyl alcohol between pigs. Skin swabs were collected using cotton-tipped swabs after application of 1 mL 0.9% sodium chloride to the lesions. Skin scrapings were placed in empty clean tubes and cotton-tipped swabs were placed in liquid Stuart’s medium and transported in a container in ambient temperature. All samples were submitted on the day of collection by taking them directly to the Animal Health Laboratory (AHL), University of Guelph, Ontario, Canada. Bacterial culture from skin samples and swabs was done, and isolates were identified as S. hyicus and S. aureus by standard laboratory techniques including colony morphology, hemolysis, Gram-stain, catalase reaction, and coagulase reaction. The recovery rates of the 2 pathogens were determined at the herd and pig levels. Antimicrobial susceptibility to penicillin G, ampicillin, ceftiofur, spectinomycin, sulphonamide, tetracycline, tiamulin, and trimethoprim/sulfamethoxazole was determined by the disk diffusion method (Kirby-Bauer Procedure) defined by the Clinical and Laboratory Standards Institute (9). For the purpose of analysing the data, intermediate level was included with the resistant level (4 of the S. aureus isolates). The antimicrobial resistance patterns of S. hyicus and S. aureus isolates were compared between 2 categories of farms: commercial farms that used antibiotics and “antibiotic-free” farms. The first group were the farms on which antibiotics were generally used routinely in-feed and by injection as needed to prevent or treat disease. The second group of farms (“antibiotic-free”) raised pigs for a special market so that pigs from birth-to-market were raised without receiving antibiotics. On these farms, if a pig became sick and needed treatment, it would be identified and removed from the production stream. Seven of the 30 farms in the cross-sectional study were categorized as “antibiotic-free” farms.

Data management and statistical analysis

The survey data from the questionnaires for farmers and swine veterinarians were entered into Epidata Entry v.3 (The Epidata Association, Odense, Denmark) and verified manually for accuracy of entry. Descriptive statistics were carried out using Stata10.1 (Statistics/Data Analysis, Texas, and USA). The results of the antimicrobial susceptibility tests of S. hyicus and S. aureus isolates were entered into Microsoft Office Excel 2007 and subsequently all data were transferred to Stata10.1 for statistical analysis.

A statistical analysis to compare the difference in antimicrobial resistance to tetracycline between S. hyicus and S. aureus isolates was performed using logistic regression with herd as a random effect on the intercept. The dependent variable was the tetracycline-resistance status of an isolate (yes/no) and the
Results

Survey for treatment of exudative epidemis

The most common approach to treatment of EE (41/58 farmers) was topical therapy, including mixtures of topical antibiotics, antiseptics, and/or mineral oil, mostly in the form of a spray (Table 1). The most frequently used topical antibiotic treatment was a mixture of procaine penicillin G and novobiocin (Novody ‘99, Pfizer Canada, Kirkland, Quebec) (69%), penicillin G (18.7%) and cephalin benzathine (Cefadri ‘99, Wyeth Animal Health, Guelph, Ontario) plus cloxacillin benzathine (Dry-Clox ‘99, Wyeth Animal Health) (6.2%). In addition, 55.2% of respondents (32/58) stated that they used injectable antibiotics and most farmers using this method (93.8%; 30/32) indicated that they preferred to use injectable penicillin G. The other injectable antibiotics recommended to each of the antimicrobials (penicillin G, ampicillin, cefotiofur, tetracycline, streptomycin, tiamulin, sulphonamide, and trimethoprim/sulfa) of S. hyicus and S. aureus separately between the commercial farms that used antibiotics and the “antibiotic-free” farms was evaluated using 2 sets of univariate regression models. Number of S. hyicus or number of S. aureus isolates that were resistant to each antimicrobial was used as a dependent variable in a separate univariable Poisson regression model. Number of antimicrobial susceptibility tests performed for the corresponding staphylococci was used as an offset, and herd-level categorical variable indicating antimicrobial usage on a farm was used as an independent variable (i.e., “antibiotic-free” farms versus commercial farms that used antibiotics).

Survey for treatment of exudative epidemis

Table 1. Antimicrobial resistance profiles for S. hyicus (n = 142) and S. aureus (n = 89) isolates from pigs with clinical signs of exudative epidemis (all 30 farms)

<table>
<thead>
<tr>
<th>Antimicrobial</th>
<th>S. hyicus % Resistant</th>
<th>95% CI</th>
<th>S. aureus % Resistant</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillin G</td>
<td>97.2%</td>
<td>94–100</td>
<td>92.1%</td>
<td>86–98</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>97.2%</td>
<td>94–100</td>
<td>92.1%</td>
<td>86–98</td>
</tr>
<tr>
<td>Cefotiofur</td>
<td>71.1%</td>
<td>64–77</td>
<td>76.4%</td>
<td>67–85</td>
</tr>
<tr>
<td>Spectinomycin</td>
<td>45.1%</td>
<td>37–53</td>
<td>48.3%</td>
<td>38–59</td>
</tr>
<tr>
<td>Sulfonamide</td>
<td>8.5%</td>
<td>4–13</td>
<td>13.5%</td>
<td>6–21</td>
</tr>
<tr>
<td>Tetracycline</td>
<td>55.6%</td>
<td>47–64</td>
<td>87.6%</td>
<td>81–91</td>
</tr>
<tr>
<td>Tiamulin</td>
<td>31.0%</td>
<td>23–39</td>
<td>15.7%</td>
<td>8–23</td>
</tr>
<tr>
<td>Trimethoprim/sulfa</td>
<td>2.1%</td>
<td>0–5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

CI — Confidence interval.
N/A — Not available.

independent variable was species designation of Staphylococcus (i.e., S. hyicus or S. aureus).

The association of the prevalence of antimicrobial resistance to each of the antimicrobials (penicillin G, ampicillin, cefotiofur, tetracycline, streptomycin, tiamulin, sulphonamide, and trimethoprim/sulfa) of S. hyicus and S. aureus separately between the commercial farms that used antibiotics and the “antibiotic-free” farms was evaluated using 2 sets of univariable Poisson regression models. Number of S. hyicus or number of S. aureus isolates that were resistant to each antimicrobial was used as a dependent variable in a separate univariable Poisson regression model. Number of antimicrobial susceptibility tests performed for the corresponding staphylococci was used as an offset, and herd-level categorical variable indicating antimicrobial usage on a farm was used as an independent variable (i.e., “antibiotic-free” farms versus commercial farms that used antibiotics).

Cross-sectional study: Bacteriology and antimicrobial susceptibility testing

The recovery rate of S. hyicus from skin samples was 76.9% (143/186) and the recovery rate of S. aureus was 48.9% (91/186) based on parallel interpretation of the 2 methods of sampling, skin scraping and skin swabs. Both S. hyicus and S. aureus were cultured from 39.8% of pigs (74/186), whereas S. hyicus was cultured alone from 33.9% of pigs (63/186) and S. aureus was cultured alone from 6.5% of the pigs (12/186). At the farm level, the recovery rate of S. hyicus was 100% (30/30) and the recovery rate of S. aureus was 80% (24/30), based on at least 1 positive isolate from a farm.

The overall antimicrobial resistance profiles are presented in Table 2. Antimicrobial susceptibility testing revealed that most S. hyicus and S. aureus isolates were resistant to the β-lactam antibiotics: penicillin G, ampicillin, and cefotiofur. Over 90% of isolates of S. hyicus and S. aureus were resistant to penicillin G and ampicillin. Over 70% of isolates of S. hyicus and S. aureus were resistant to cefotiofur. Antimicrobial resistance of S. hyicus (55.6%) and S. aureus (87.6%) to tetracycline was also common. Antimicrobial resistance patterns of the 2 pathogens were very similar, except that resistance to tetracycline was higher in S. aureus than in S. hyicus (odds ratio (OR): 14.29, 95% confidence interval (CI): 4.50–47.62, P < 0.01).

Resistance to 1 or more antimicrobials was detected in 99.3% (142/143) of S. hyicus isolates. Resistance to 5 or more antimicrobials was detected in 40.6% (58/143) of S. hyicus isolates. The most common resistance patterns for S. hyicus isolates were penicillin G-ampicillin-ceftiofur (24.5%, 35/143), penicillin G-ampicillin-ceftiofur-spectinomycin-tetracycline-tiamulin (12.6%, 18/143), penicillin G-ampicillin-spectinomycin-tetracycline-tiamulin (11.2%, 16/143), and penicillin G-ampicillin-ceftiofur-tetracycline (9.1%, 13/143). Resistance to 1 or more antimicrobials was detected in 98.9% (90/91) of S. aureus isolates. Resistance to 5 or more antimicrobials was detected in 39.6% (36/91) of S. aureus isolates. The most common resistance patterns of S. aureus isolates were penicillin G-ampicillin-ceftiofur-tetracycline (28.6%, 26/91), penicillin G-ampicillin-ceftiofur-spectinomycin-tetracycline (22.0%, 20/91), penicillin G-ampicillin-tetracycline (8.8%, 8/91), and penicillin G-ampicillin-ceftiofur (7.7%, 7/91).

When examined descriptively, the difference in prevalence of resistance of S. aureus isolates to penicillin G and ampicillin between commercial farms that used antibiotics and “antibiotic-free” farms was 24.9% (Figure 1). Similarly, there was a lower prevalence of resistance of S. aureus isolates from “antibiotic-free” farms to all other antimicrobials (with the exception of tiamulin) (Figure 1). In contrast, the prevalence of resistance of S. hyicus isolates from “antibiotic-free” farms to penicillin G, ampicillin, and cefotiofur was numerically higher than for isolates (14/15). Approximately a quarter of the veterinarians (4/15) recommended autogenous vaccines as an aid to controlling EE, but only 5% of the farmers (3/58) considered vaccination to be an option. Five swine practitioner respondents (33.3%) in surveys expressed some concern that response to treatment was poor.
from farms that used antibiotics (Figure 1). However, there was no significant difference in prevalence of antimicrobial resistance of \textit{S. hyicus} isolates ($P > 0.328$) or \textit{S. aureus} isolates ($P > 0.486$) to any antimicrobial when “antibiotic-free” farms and commercial farms that used antibiotics were compared.

**Discussion**

Exudative epidermitis (EE) is a sporadic disease that causes significant problems and economic losses on certain farms, particularly those that are newly populated (1). Mortality and morbidity may be high during an outbreak of EE. However, even mild expressions of the disease can negatively influence the price of feeder pigs, because the readily visible skin lesions make weanling pigs with clinical signs of EE difficult to sell. It is possible that recent trends in the industry such as an increase in litter size and a move to not clip needle teeth at birth may be leading to an increase in EE.

The traditional treatment for EE has been the prompt use of antiseptics for wounds or injection of clinically affected pigs with procaine penicillin G (10). The surveys of pork producers and veterinarians demonstrate that penicillin G is still considered an appropriate drug for treatment of EE, but antimicrobial susceptibility results strongly contradict this idea. Studies from other countries have also demonstrated a high level of resistance to penicillin G among \textit{S. hyicus} isolates (11–18).

The Danish national monitoring program showed the antimicrobial resistance profiles of bacteria from diagnostic submissions (17). In the report from this program, \textit{S. hyicus} isolates from cases of skin disease (2001 to 2008) showed a moderately high resistance to penicillin G (60% to approximately 80%) (19). The present study of Ontario pigs shows a much higher proportion of resistance with over 90% of isolates from cases of EE resistant not only to penicillin G, but in most cases, to other members of the \beta-lactam family of antibiotics, including ampicillin and ceftiofur. These results help to explain the poor response to treatment of EE reported by farmers, because penicillin G as seen in the study was the farmers treatment of choice to resolve EE. There should be more timely and regional antimicrobial resistance profiles to provide guidelines for using effective antimicrobials (20,21).

Overall the antimicrobial resistance patterns for \textit{S. hyicus} and \textit{S. aureus} were similar in all isolates from 30 farms; however, tetracycline resistance was more common in \textit{S. aureus} isolates compared with \textit{S. hyicus} isolates with the penicillin G-ampicillin-ceftiofur resistance pattern being the most prevalent in \textit{S. hyicus} isolates and penicillin G-ampicillin-ceftiofur-tetracycline resistance pattern being the most prevalent pattern in \textit{S. aureus} isolates. When examined descriptively, frequency of resistance of \textit{S. aureus} to \beta-lactam antibiotics appeared lower for isolates from “antibiotic-free” farms compared with isolates from farms that used antibiotics. The reverse was true for descriptive examination of \textit{S. hyicus} isolates; the frequency of resistance to \beta-lactam antibiotics appeared lower for isolates from commercial farms compared with isolates from “antibiotic-free farms.” It appeared that reduced antibiotic pressure was associated with
a reduction of resistance in the *S. aureus* population but not in the *S. hyicus* population. Selection of *S. aureus* strains with resistance plasmids or chromosomally encoded resistance genes might be an explanation of this phenomenon. Information on how long farms had maintained their antibiotic-free status was not available for the present study and this knowledge might have been useful in interpreting the resistance data. In general, one can conclude that whether or not antimicrobials are being used on the farm, *S. hyicus* and *S. aureus* will likely be resistant to penam penicillins, at least according to *in-vitro* testing.

In the present study, the disk diffusion method (Kirby-Bauer Procedure) was used to test for antimicrobial susceptibility of *S. hyicus* and *S. aureus*. The antimicrobial susceptibility test results apply to the population of animals on the farm, but not necessarily to individual animals. The disk diffusion method has some limitations in extrapolation of the data to minimum inhibitory concentration (MIC) (22). Furthermore, when we apply the results of antimicrobial susceptibility testing to clinical cases, to achieve better treatment success, pharmacokinetic-pharmacodynamic parameters should be considered: the bound versus unbound state of the agent, tissue versus plasma concentrations, drug degradation over time, variations among micro-organisms, and factors associated with the specific environment at the infection site (23). Failing to consider these parameters contributes to discrepancies between *in-vitro* results of antimicrobial susceptibility tests and clinical outcomes following using of the selected antimicrobials (24). Ceftriaxone is the injectable antimicrobial second most frequently recommended by veterinarians in the present study. This antimicrobial is resistant to penicillins so that it would seem more likely to be effective in the treatment of a staphylococcal infection that is resistant to penam penicillins. However, ceftriaxone is not a good choice for staphylococcal infection because of its relatively high MIC90 (Minimal Inhibitory Concentration needed to inhibit the growth of 90% of the bacterial population, 1.0 µg/mL). In addition, the MIC90 of desfuroylceftiofur (a metabolite of ceftriaxone in the body) is 4.0 to 8.0 µg/mL, in contrast to that for other organisms such as *Pasteurella multocida* and *Actinobacillus pleuropneumoniae* (MIC90, 0.03 µg/mL). Thus, a higher dosage of ceftriaxone is required to treat a *S. hyicus* infection than to treat other bacterial infections (22).

The antimicrobial agents that were tested in the study were limited; for example, the use of novobiocin was reported frequently, but it was not included in our antimicrobial susceptibility test. Information on antimicrobial resistance of *S. hyicus* and *S. aureus* to novobiocin would be useful for farmers and veterinarians.

In conclusion, the likely reason for the poor response to treatment of EE in the southwestern Ontario region in this study was the presence of widespread antimicrobial resistance of *S. hyicus* and *S. aureus* isolates, especially to β-lactam antibiotics. Therefore, pork producers and swine veterinarians would benefit from having bacterial culture and antimicrobial susceptibility tests done prior to treating EE diseased pigs; if that is not feasible trimethoprim-sulfa appears to be a reasonable choice in that almost all staphylococcal isolates examined in this study appeared to be susceptible *in vitro*.

**Acknowledgments**

The research was funded by Ontario Pork, the Animal Health Strategic Initiative Fund, Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) and the University of Guelph. We are grateful to the farmers who allowed us to sample pigs and who answered our survey, and Brian Blofield for technical assistance.

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### Answers to Quiz Corner
**Les réponses du test éclair**

1.  d) Diazepam is a centrally acting muscle relaxant that counteracts the muscle rigidity caused by ketamine alone.
   d) Le diazépam est un relaxant musculaire qui agit centralement pour neutraliser la rigidité musculaire causée par l’utilisation de la kétamine seule.

2.  b) These breeds are predisposed to subaortic stenosis.
    b) Ces races de chiens sont prédisposées à la sténose subaortique.

3.  b) Patients with chronic renal failure are often anemic because of erythropoietin deficiency.
    b) Les animaux qui souffrent d’insuffisance rénale chronique sont souvent anémiques à cause d’une carence en érythropoïétine.

4.  e) Viral infections, such as canine distemper, are less likely causes of epistaxis than are the other conditions listed.
    e) Les infections virales, comme le distemper canin, sont moins susceptibles de causer de l’épistaxis que les autres affections énumérées.

5.  b) The insulin requirement decreases with time because the insulin antagonism of glucocorticoids is lessened by reduced production of glucocorticoids.
    b) Les besoins en insuline diminuent avec le temps parce que l’antagonisme insulinique des glucocorticoides est amoindri par la diminution de production des glucocorticoides.

6.  d) *E. coli* is most likely to be involved with pyometra. The drug with the most efficacy against this bacterium should be chosen. Of the choices available, a second-generation cephalosporin would be most effective.
    d) *E. coli* est la plus susceptible d’être impliquée dans un pyomètre. Le médicament qui possède la plus grande efficacité contre cette bactérie doit être choisi. De tous les choix disponibles, une céphalosporine de deuxième génération est la plus efficace.

7.  d) Cystorrhaphy is the surgical term for suturing the bladder.
    d) La cystorrhaphie est le terme chirurgical pour désigner la suture de la vessie.

8.  b) Acute and convalescent antibody titers are the most practical method of confirming equine influenza viral infection.
    b) Les titres d’anticorps aigus et convalescents sont la méthode la plus pratique pour confirmer une infection virale d’influenza équine.

9.  e) Plasma fibrinogen concentrations become elevated as a result of a chronic inflammatory stimulus.
    e) Les concentrations de fibrinogène plasmatique augmentent à la suite d’un stimulus inflammatoire chronique.

10. b) Lymphosarcoma commonly involves the peripheral lymph nodes, right atrium, and spinal cord.
    b) Le lymphosarcome implique communément les nœuds lymphatiques périphériques, l’oreillette droite et la moelle épinière.
Animal control measures and their relationship to the reported incidence of dog bites in urban Canadian municipalities

Nancy M. Clarke, David Fraser

Abstract — Various measures, including ticketing, licensing, and breed-specific legislation, are used by municipalities to control dog bites, but their effectiveness is largely unknown. Thirty-six urban Canadian municipalities provided information about their animal control practices, resourcing, and (for 22 municipalities) rate of reported dog bites. Municipalities differed widely in rates of licensing (4% to 75%) and ticketing (0.1 to 83 per 10 000 people), even where staffing and budgets were similar. Reported frequency of dog bites ranged from 0 to 9.0 (median 1.9) per 10 000 people. Rates were generally higher in municipalities with higher ticketing, licensing, staffing, and budget levels. However, in municipalities with very active ticketing the reported bite rate was much lower than predicted by a linear regression on ticketing rate (quadratic regression, $R^2 = 0.52$), likely reflecting a reduction in actual bites with very active enforcement. Municipalities with and without breed-specific legislation did not differ in reported bite rate. Ticketing appeared most effective in reducing dog bites, although it may also lead to increased reporting.

Introduction

Dog bites appear to be a significant but under-reported risk to public safety. Based mainly on a national telephone survey conducted in the United States in 1994 (1), the Centers for Disease Control estimate that 1.8% of Americans are bitten annually by dogs (2). Canadian data are lacking; however, the Canada Safety Council estimates a similar prevalence (3). Although media attention to dog bites (4) has led to calls for improved animal control measures including more effective legislation, higher penalties, increased enforcement, and public education (5,6), the effectiveness of such measures is not well-established.

In many countries, including Canada, animal control is managed by municipal governments. Local autonomy allows communities to be responsive to local needs and values, but it also results in a patchwork of regional programs with different legislation, resourcing levels, and levels of emphasis on enforcement, licensing, and education. As one aspect of the variation, some municipalities have created breed-specific legislation (BSL) which bans or limits ownership of specified breeds.

Because of the decentralized nature of animal control in Canada, the range of practices and their effectiveness is largely unknown. The objectives of this research were to: i) compare ticketing, dog licensing, public education, animal control budget and staffing levels in various urban Canadian municipalities; ii) determine the rate of reported dog bites in those municipalities; and iii) ascertain the relationship between reported dog bite rates and control measures.
Eighty-five Canadian municipalities were identified with populations of ≥ 30 000 people, defined as urban because they comprise either a Census Metropolitan Area or a Census Agglomeration as defined by Statistics Canada (7). Each municipality was telephoned by a bilingual (French/English) research assistant who secured the name and contact information of the person responsible for animal control services in the municipality. A questionnaire was sent to this person with a covering letter which explained the project. The questionnaire, composed of open and closed questions, queried the municipality’s demographics, its estimated dog population, its animal control populations of

<table>
<thead>
<tr>
<th>Province/Region</th>
<th>N</th>
<th>Licensing (%) estimated dogs</th>
<th>Ticketing /10 000</th>
<th>Budget /$1000/10 000</th>
<th>Staffing /1 000 000</th>
<th>Reported dog bites /10 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Columbia</td>
<td>13</td>
<td>14–65 (30)</td>
<td>0.1–48.5 (5.5)</td>
<td>15.3–100.6 (39.2)</td>
<td>15–111 (45)</td>
<td>0.0–9.0 (1.8)</td>
</tr>
<tr>
<td>Alberta</td>
<td>2</td>
<td>42–57 (49)</td>
<td>14.1–36.0 (25.0)</td>
<td>26.4–37.0 (31.7)</td>
<td>22–31 (26)</td>
<td>2.1–3.1 (2.6)</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>2</td>
<td>31–76 (53)</td>
<td>67.5–83.4 (75.4)</td>
<td>7.4–48.3 (27.8)</td>
<td>34–82 (58)</td>
<td>2.4</td>
</tr>
<tr>
<td>Manitoba</td>
<td>1</td>
<td>35</td>
<td>4.6</td>
<td>29.8</td>
<td>17</td>
<td>2.0</td>
</tr>
<tr>
<td>Ontario</td>
<td>10</td>
<td>7–41 (15)</td>
<td>1.3–5.0 (3.2)</td>
<td>16.8–56.6 (33.1)</td>
<td>8–50 (27)</td>
<td>0.2–1.9 (1.9)</td>
</tr>
<tr>
<td>Quebec</td>
<td>7</td>
<td>4–16 (20)</td>
<td>0.1–20.1 (0.9)</td>
<td>6.6–18.1 (7.8)</td>
<td>7–29 (13)</td>
<td>0.1–8.1 (0.3)</td>
</tr>
<tr>
<td>Atlantic Region</td>
<td>1</td>
<td>5</td>
<td>0.9</td>
<td>25.2</td>
<td>61</td>
<td>1.5</td>
</tr>
<tr>
<td>All</td>
<td>36</td>
<td>4–75 (21)</td>
<td>0.1–83.4 (4.7)</td>
<td>6.6–100.6 (28.4)</td>
<td>7–111 (31)</td>
<td>0.0–9.0 (1.9)</td>
</tr>
</tbody>
</table>

N = number of municipalities that participated in the study.

Table 1. Range and (median) values for licensing rate, ticketing rate, budget rate, staffing rate, and reported dog bite rate in different provinces/regions

- Licensing rate: The number of dog licenses sold annually in the municipality as a percentage of the estimated dog population.
- Ticketing rate: The number of violation notices (tickets) issued annually by animal control enforcement staff per 10 000 human population.
- Budget rate: The annual expenditure on animal control services, expressed in Canadian dollars per 10 000 human population.
- Staffing rate: The number of full-time-equivalent animal control (enforcement) staff employed per 1 000 000 human population.
- Public education rate: The annual expenditure on public education, excluding staff costs, expressed in dollars per 10 000 human population.
- Reported dog bite rate: The number of dog bites reported annually to animal control authorities per 10 000 human population.

Data analysis
Analysis was based on 2005 data because that year had the highest response rate for most items. Data for other years were similar. Data were analyzed by non-parametric methods where possible because of the non-normal distribution of most data. To identify relationships between variables, Spearman’s rank order correlation coefficients (two-tailed) were first calculated among the key variables. Further analysis of reported dog bite rate was done by regression analysis (SAS Version 9.1; SAS Institute, Cary, North Carolina, USA) because non-parametric equivalent was available. Specifically, reported dog bite rate (as the outcome variable) was tested against the linear and quadratic effects of ticketing rate, licensing rate, budget rate, and staffing rate.
The results also allowed a comparison of municipalities that did and did not have BSL. A simple comparison of municipalities with and without BSL was performed using the non-parametric Mann-Whitney U-test which is appropriate for data that do not meet the assumptions of parametric analysis (11). To provide a more powerful comparison (but less correct for data that are not normally distributed), this regression analysis was repeated with the municipality’s use or non-use of BSL included as a treatment. The analysis thus tested for any differences between municipalities with and without BSL after variation due to effects of ticketing rate, licensing rate, budget rate, and staffing rate had been taken into account. The analysis also tested for any interaction of the treatment (BSL versus non-BSL municipalities) and these variables.

Results

The participating animal control agencies served approximately 32% of Canada’s estimated population of 31.6 million (9). The populations ranged from 32 500 to 2.7 million (median 146 000) and population densities ranged from 244 to 9119 (median 1411) people/km². Dog populations as estimated from the national average were very similar to estimates provided by the municipalities, except that the number provided by the city of Toronto was lower than the estimated value. (Dog ownership in this multicultural city may be less than the national average.) Local estimates were highly correlated with estimates made on the basis of the national average if Toronto were excluded ($r = 0.93$, $P < 0.001$).

Enforcement and resourcing

Municipalities differed widely on all variables (Table 1). The percentage of dogs licensed ranged from a low of 4% in 1 municipality to 76% in another. Ticketing rates showed wide variation, from 0.1 to 83 tickets per 10 000 people, with a median rate of 4.7. Budget rate for animal control (expressed to the nearest $10000) was less variable, with a median of $28 450 per 10 000 people and generally low values in the province of Quebec as reflected by a low median. The number of animal control staff (full-time equivalents) per 1 000 000 people was variable, with a median of 31 and low values in most Quebec municipalities.

All municipalities reported providing some form of public education. Twenty-six of 36 municipalities distributed written materials, while only a few provided more interactive methods such as face-to-face courses and seminars (dog management, dog obedience, by-law awareness, dog bite prevention) or canine behavioral counselling and training assistance for dog owners. Municipalities reported annual public education expenditures that ranged from $0 (3 municipalities) to $4100 per 10 000 people, with a median of $260 per 10 000 people, or roughly 1% of the overall animal control budget. However, in most municipalities (30/36), this figure did not reflect total educational effort because education was integrated into the duties of enforcement staff.

Staffing, budget, and licensing rates were significantly correlated with each other ($r = 0.50$ to 0.61; Table 2). Ticketing rate was significantly correlated with licensing rate ($r = 0.59$) but not with budget rate or staffing rate (Table 2). The 7 municipalities with a ticketing rate > 10 tickets per 10 000 people resembled the national average in budget and staffing rates. In these municipalities, which included 2 in each of Alberta, Saskatchewan, and Quebec and 1 in British Columbia, staffing rates ranged from 13 to 85 animal control officers per 1 000 000 people, with a median of 31, and animal control budgets ranged from $7000 to $101 000 per 10 000 people, with a median of $26 000. At least 5 of these 7 municipalities were engaged in formal organizational efforts to increase by-law compliance.

Reported dog bites

Twenty-two municipalities provided data on reported dog bites. Reported dog bite rate was variable, from 0.0 per 10 000 people in 1 jurisdiction to 9.0 in another and a median of 1.9 (Table 1). Seven municipalities indicated that the information was unavailable and 8 gave no reason for not responding to survey questions about reported dog bites. The reporting officers of 24/34 municipalities felt that the dog bite issue was less severe or had not changed over the previous 5 y.

Neither population size nor density showed a significant relationship to reported dog bite rates. However, the reported dog bite rate was generally very low in municipalities with very low rates of ticketing, licensing, budget, and staff, but was higher when these variables were in the medium range. As a result, reported dog bite rates showed a clear positive correlation with each of these variables (Table 2). However, at higher rates of ticketing and licensing, the reported dog bite rate was much lower than would be expected based on a linear trend. Regression analysis of reported dog bite rate on ticketing rate (Figure 1) showed a much better fit with a quadratic regression in the shape of an inverted U ($R^2 = 0.519$) than with linear regression ($R^2 = 0.189$). Both linear and quadratic components were significant ($P < 0.01$, Table 3), although the P-values are not considered to be reliable because the assumptions of parametric analysis were not met. A similar but weaker relationship was seen with licensing rate. Specifically, the reported dog bite rate showed a significant positive linear regression on licensing rate ($P < 0.05$), while the negative quadratic component approached significance ($P < 0.10$, Table 3). Reported dog bite rate showed no significant regression on budget rate or staffing rate (Table 3), nor was there any significant relationship with public education expenditure.

| Table 2. Spearman rank-order correlation coefficients for reported dog bite rate and 4 measures of enforcement and resourcing |
|------------------|------------------|------------------|------------------|------------------|
|                  | Licensing rate   | Budget rate      | Staffing rate    | Reported dog bite |
| Ticketing rate   | $0.59^b$         | $0.34$           | $0.38$           | $0.86^c$         |
|                  | $n = 27$         | $n = 23$         | $n = 27$         | $n = 18$         |
| Licensing rate   | $0.61^c$         | $0.54^c$         | $0.82^c$         |                  |
|                  | $n = 29$         | $n = 35$         | $n = 21$         |                  |
| Budget rate      | $0.50^b$         |                  | $0.63^b$         |                  |
|                  | $n = 29$         |                  | $n = 19$         |                  |
| Staffing rate    |                  | $0.44^d$         |                  |                  |
|                  |                  | $n = 21$         |                  |                  |

* $P < 0.05$.  
  * $P < 0.01$.  
  * $P < 0.001$.  

Figure 1. Regression analysis of reported dog bite rate on ticketing rate (linear and quadratic terms)
Thirteen municipalities [British Columbia (n = 7), Ontario (n = 3), Alberta (n = 1), Manitoba (n = 1), and Quebec (n = 1)] had some form of BSL and 23 did not. The Mann-Whitney U-test revealed no significant differences between municipalities with and without BSL in the rates of licensing, ticketing, budget, and reported dog bites (Table 4). Staffing rate was somewhat lower in municipalities without BSL (U = 84.00, P < 0.05). The more precise comparison based on regression analysis showed no difference between municipalities with and without BSL in reported dog bite rate, after the linear and quadratic effects of ticketing rate and other variables had been taken into account, and no significant interaction between the treatment (use or non-use of BSL) and the other variables.

Discussion

In the absence of actual dog ownership information, municipal dog populations were estimated by applying national population data to all municipalities. Dog ownership rates may not be uniform among municipalities, however, the estimates that resulted from applying the national average were highly correlated with the municipalities’ own estimates, with one exception.

There were large differences between municipalities that appeared to reflect very different animal control strategies. With the exception of Saskatchewan and the Atlantic region, all provinces included some municipalities with breed-specific by-laws. Most (but not all) Quebec municipalities had low commitment of resources and some of the lowest levels of enforcement and of compliance with licensing requirements. On average, municipalities in Ontario, British Columbia, and the prairie provinces had similar levels of budget and staffing. However, several municipalities, widely dispersed across the country, put greater emphasis on enforcement and had much higher rates of ticketing and licensing, despite similar levels of expenditure.

The reported dog bites likely represented a small fraction of all dog bites that occurred in the municipalities. Studies have found that the reporting rate for dog bites was very low in Canada (12) and in Pennsylvania (13). If the published estimate of 1.8% of Americans bitten each year (1) is roughly applicable in Canada, then the median value of 1.9 per 10 000 as found in this study would represent roughly 1% of the total number of bites inflicted. Presumably, this is due in part to a high percentage of “household” bites (bites by a dog to a family member, which are rarely reported to authorities) and a very low rate of reporting non-household bites (1,14,15).

The positive correlation between reported dog bite rate and enforcement indicators likely reflects a higher reporting rate in municipalities with active animal control programs. Where there is very little enforcement, animal control authorities may be relatively invisible to the public, whereas moderate levels of enforcement may create greater public awareness and willingness to report bite incidents. An alternative explanation — namely that large pre-existing differences in reported dog bite rate caused municipalities to adopt very different enforcement strategies — seems less plausible. While some differences in reported dog bite rate may occur and influence local responses, the very large differences observed — with municipalities differing by 10-fold or 100-fold in the same province — seem unlikely to occur as background variation that then triggers different approaches by local authorities.

Despite the positive correlation, if enforcement is effective in actually reducing dog bites, then we would expect fewer reported dog bites at very high levels of enforcement, since reduction in actual biting would compensate to some degree for the increase in reporting. The regression analysis was consistent with this view. Specifically, in the regression of reported dog bite rate on ticketing rate, an inverted U curve (quadratic regression) made

**Figure 1.** Linear and quadratic regression of reported dog bite rate on ticketing rate.
a much better fit to the data than a linear regression, possibly because the actual dog bite rate declined at very high rates of ticketing. A similar but weaker relationship was found with licensing rate. Because licensing and ticketing were closely correlated, it is not clear that licensing by itself has any effect on dog bite incidence. Nonetheless, licensing may be an important part of a successful enforcement program, since it allows dogs and owners to be identified, and in some municipalities the revenue from license fees is sufficient to fund effective enforcement.

The regression analysis and associated P-values must be interpreted carefully because the data do not conform to the assumptions of multivariate analysis. First, although the municipalities are widely distributed across the country and represent a substantial fraction of the total population, they are a non-random sample. Hence, they can be seen as informative of the situation but not randomly selected. Second, the data were far from normally distributed, with some municipalities being very different from the average and exerting a disproportionate influence on the analysis. For these reasons, the regression analysis should be regarded not as testing hypotheses through the use of theoretically ideal data, but as fitting the best curve to actual data as a basis for identifying the most plausible interpretation of the relationships.

The data also provided a basis for comparing reported dog bite rates in municipalities with and without BSL. Neither the simple non-parametric comparison, nor the comparison after adjusting for the effect of enforcement in the regression analysis, provided any evidence that municipalities with BSL had fewer dog bites. Similar negative conclusions have been reached in studies that used other means of assessing the effectiveness of BSL (16–18). Moreover, other Canadian studies suggest that breeds commonly banned in breed-specific legislation account for a relatively small fraction of dog bites (19) and fatalities (20), and that these breeds are not more likely to bite than a matched sample of other breeds (21).

Education is often considered to be a key component in reducing dog bites (6,22). In this study, only about 1% of animal control budgets were identified for education. However, many municipalities may have used enforcement staff to conduct some education. Hence the lack of relationship between education budget and reported dog bites should not be interpreted to mean that education is ineffective.

In conclusion, this study showed a wide range in dog control activities in various Canadian municipalities, including different levels of resourcing combined with varying levels of licensing, enforcement, and other measures. The results are most consistent with the view that i) a high level of ticketing, perhaps combined with effective licensing, may lead to a reduction in dog bites, although it may also be accompanied by an increase in reporting of bites; and ii) seemingly effective enforcement levels were achieved in some municipalities at levels of budget and staffing commonly seen in Canadian municipalities. The data provided no evidence of lower dog bite incidence in municipalities with breed-specific legislation.

Acknowledgments

We are grateful to the Canadian municipalities that shared their data and thus made the study possible. The research was supported by the Natural Sciences and Engineering Research Council of Canada and by the UBC Animal Welfare Program and its donors.

References

Evaluation of acepromazine-induced hemodynamic alterations and reversal with norepinephrine infusion in standing horses

Manuel Pequito, Hélène Amory, Brieuc de Moffarts, Valeria Busoni, Didier Serteyn, Charlotte Sandersen

Abstract — The effects of norepinephrine (NOR) infusion on hemodynamic alterations induced with sedative doses of acepromazine (ACP) were evaluated. Infusion of NOR at 1 μg/kg body weight (BW)/minute for 15 min was administered to 5 standing horses 45 min (T_45) after intravenous injection of ACP at 0.1 mg/kg BW. Systolic arterial blood pressure (SAP) and hemodynamic parameters were evaluated on the median artery. Parameters were evaluated every 5 min from 45 to 65 min (T_65) at 75 (T_75), 90 (T_90), and 105 (T_105) minutes after ACP administration, and the vessel's surface (SURF), diameter (DIAM), circumference (CIRC), peak systolic velocity (PSV), end diastolic velocity (EDV), mean velocity (MV), volumetric flow (VF), and resistivity index (RI) of the flow were calculated. Acepromazine induced hypotension and vasodilation with a significant rise in SURF, DIAM, CIRC, PSV, EDV, MV, and VF and a reduction in RI and SAP, which were significantly counteracted from T_50 to T_60 for EDV, VF, MV and RI, and to T_65 for SAP, from T_50 to T_90 for CIRC and SURF and to T_65 for DIAM. These findings demonstrate that a 1 μg/kg BW/minute NOR infusion can reverse ACP’s vasodilatory effects, restoring hemodynamic parameters and blood pressure in horses.

Résumé — Évaluation d’altérations hémodynamiques induites par l’acépromazine et inversion par une infusion de norépinéphrine chez des chevaux debout. Les effets d’une infusion de norépinéphrine (NOR) sur les altérations hémodynamiques induites avec des doses sédatives d’acépromazine (ACP) ont été évalués. Une infusion de NOR à 1 μg/kg poids corporel (PC)/minute pendant 15 minutes a été administrée à 5 chevaux debout 45 minutes (T_45) après une injection intraveineuse d’ACP à 0,1 mg/kg PC. La tension artérielle systolique (TAS) et les paramètres hémodynamiques ont été évalués sur l’artère médiane. Les paramètres ont été évalués toutes les 5 minutes, de 45 à 65 minutes (T_65), puis 75 (T_75), 90 (T_90) et 105 (T_105) minutes après l’administration d’ACP et la surface (SURF), le diamètre (DIAM), la circonférence (CIRC), le pic de vélocité systolique (PVS), la vélocité en fin de diastole (VFD), la vélocité moyenne (VM) et l’écoulement volumétrique (EV) du vaisseau ainsi que l’indice de résistivité (IR) du débit ont été calculés. L’hypotension et la vasodilatation induites par l’acépromazine causant une hausse significative de SURF, de DIAM, de CIRC, de PVS, d’EV, de VM et de EV ainsi qu’une réduction d’IR et de TAS ont été significativement compensées de T_50 à T_60 pour EDV, VF, MV et RI, à T_65 pour SAP, de T_50 à T_90 pour CIRC et SURF et à T_65 pour DIAM. Ces constatations démontrent qu’une infusion de 1 μg/kg PC/minute NOR peut inverser les effets vasodilatoires d’ACP, rétablissant les paramètres hémodynamiques et la tension artérielie chez les chevaux.

(Traduit par Isabelle Vallières)
Introduction

Acepromazine (ACP), a phenoxyzine (PHE) commonly used in horses as a sedative agent in preanaesthetic protocols (1), or in the treatment of laminitis (2) has peripheral hemodynamic effects in horses: it induces an increase in the blood flow and has a concomitant vasodilatory effect on the digital vasculature (3,4), metatarsal artery (5), and microcirculation in the coronary band and laminae (4). The peripheral vasodilatation, evident after intramuscular injection of 0.05 and 0.055 mg/kg body weight (BW) is the major side effect (5,6).

Undesirable effects of ACP are particularly prominent and may become life-threatening when horses suffer from hypotension, anemia, or dehydration (1). In normovolemic and hemodynamically stable horses, the drop in blood pressure is without major consequences, but the risk of hypotensive crisis and subsequent collapse is high if the patient shows volume depletion (7). This low blood pressure results from blockade of the $\alpha_1$-adrenergic receptors (8) or from depression of the central vasomotor center (9).

Other pharmacological properties of ACP are anti-inflammatory and antioxidant effects (2). Acepromazine diminishes monocyte TNF-α production, inhibits the differentiation of monocytes into macrophages (10,11), and decreases the production of reactive oxygen species (2,12). These properties account for the therapeutic value of ACP in equine patients with inflammatory diseases. However, in order to safely administer ACP to high-risk patients, it is essential that a hypotensive crisis be avoided.

Vasoconstrictor drugs, including $\alpha$-sympathomimetics, such as norepinephrine (NOR) may help to modulate the vasodilatory effects of ACP. Norepinephrine is an endogenous as norepinephrine (NOR) may help to modulate the vasodilatory effects of ACP (7). The peripheral vasodilatation, evident after intramuscular injection of 0.05 and 0.055 mg/kg body weight (BW) is the major side effect (5,6).

Peripheral hemodynamic variables were measured ultrasonographically, with horses fully weight-bearing on all 4 limbs. Images were taken from the median artery of the right forelimb, immediately below the chestnut, after shaving the medial aspect of the region, using a Phase Array 7 MHz probe coupled to the ultrasound machine (model RT 6800; General Electric, Brussels, Belgium). No offset pad was used but a copious amount of coupling gel was applied. The artery was initially examined in B-mode, in transverse and then in longitudinal planes. The Doppler sample volume was placed centrally within the vessel in order to obtain the velocity waveforms. The angle between the probe and the vessel was always below 55° and the velocity waveforms chosen were those that presented the clearest visual and acoustic signal, and were the most homogenous. For each parameter evaluated, the mean of 3 successive measurements (throughout at least 10 cardiac cycles) was the final value retained.

From a B-mode ultrasonography, the hemodynamic parameters measured included the diameter (DIAM), circumference (CIRC), and surface (SURF) of the vessel. From the Doppler images, the peak systolic velocity (PSV) and the end diastolic velocity (EDV) were measured by placing the cursor at the apex of the maximal upward motion of blood flow, during systole, and at the minimal velocity of blood flow, during the end of diastole, respectively. The area under the velocity waveform (VTI) was measured by tracing the modal velocity envelope, represented by the brightest line in the spectral Doppler waveform. The heart rate (HR) was calculated by counting the number of Doppler curves per minute and the mean velocity (MV), volumetric flow (VF), and resistivity index (RI) were calculated using the following formulae:

\[ MV = VTI \times \text{HR} \]
\[ VF = \text{SURF} \times \text{MV} \]
\[ RI = (\text{PSV} - \text{EDV})/\text{PSV} \]
The arterial velocity waveforms were also morphologically analyzed for shape of the systolic peak and amount and direction of blood flow during diastole.

Heart rate, cardiac rhythm, and a continuous base-apex ECG were continuously recorded by a Holter monitor (model Vista; Verimed Medical Supply, Wetteren, Belgium) during the study. Systolic arterial blood pressure was indirectly and manually measured at the tail, using an ultrasonic Doppler flow detector (model 811-B; Park’s Medical Electronics, 9.5 MHz probe) together with a 10 cm width cuff and a manometer. The SAP values were the mean of 3 consecutive measurements.

Before the beginning of the study, a 16 G catheter was aseptically inserted in the left jugular vein, in a clipped site, previously anesthetized with lidocaine 2%. Each mare received an intravenous bolus of ACP (Combistress; Kela Laboratoria, Hoogstraten, Belgium), 0.1 mg/kg BW and 45 min later an intravenous infusion of NOR (Levophed; Abbot N.V., Wavre, Belgium), 1 μg/kg BW/min for 15 min. Norepinephrine infusion would be interrupted if 1 of the following situations was presented: a HR higher than 60 beats/min, an increase in the SAP over 180 mmHg, abnormalities in cardiac rhythm, or excitement. The choice of the dose of NOR was based on a preliminary protocol, in which the mares received only NOR without ACP premedication.

The SAP was recorded immediately before administration of ACP (T0) and every 15 min for 45 min after administration. Then the infusion of NOR was immediately started and maintained for 15 min while the SAP was measured every 5 min and ultrasound images were taken. At the end of the NOR infusion SAP continued to be regularly measured until T105 and ultrasonographic images were obtained for 15 min while the SAP was measured every 5 min and ultrasound images continued to be taken until T90. Overall SAP was statistically higher compared to T45. From T75 to T105, SAP was no longer statistically higher than at T45. From T90 onwards only the effect of ACP was present (Figure 2, Table 1).

Acepromazine induced a significant drop in the SAP from T15 to T45. However, during the NOR infusion, the SAP significantly increased at T50, T55, and T60, compared with T0 and T45, respectively. At T65 the SAP rapidly decreased, but remained statistically higher compared to T45. From T75 to T105, SAP was no longer statistically higher than at T45, while the DIAM, at T65 and T90 increased again, to values similar to those at T45 (Figure 3, Table 2).

At T45, the PSV, EDV, MV, and VF significantly increased, while RI significantly decreased compared with T0. Acepromazine induced a significant increase in the DIAM, CIRC and SURF, at T45, in comparison with T0. However, during the NOR infusion, those parameters significantly decreased from T45, and became similar to the values measured at T0. At T65 and T90 the CIRC and SURF, although numerically increased, stayed statistically smaller than at T45, while the DIAM, at T65 and T90 increased again, to values similar to those at T45 (Figure 3, Table 2).

The Doppler waveforms observed at T0 were biphasic, with a small spectral window and no reverse flow, which is characteristic of an intermediate resistance flow pattern. During systole, there was a sharp rise in flow velocity and a rapid decline toward baseline, and during diastole an oscillatory portion with alternating acceleration and deceleration of the antegrade blood flow. At T45, the waveforms matched a low resistance flow pattern, with a diastolic velocity higher than at T0, and a smaller Doppler shift on the initial alternating acceleration-deceleration phase. During the NOR infusion the Doppler curves indicated a smaller diastolic velocity, comparable to those from T0.

**Results**

Acepromazine induced a significant drop in the SAP from T15 to T45. However, during the NOR infusion, the SAP significantly increased at T50, T55, and T60, compared with T0 and T45, respectively. At T65 the SAP rapidly decreased, but remained statistically higher compared to T45. From T75 to T105, SAP was no longer statistically higher than at T45, while the DIAM, at T65 and T90 increased again, to values similar to those at T45 (Figure 3, Table 2).

At T45, the PSV, EDV, MV, and VF significantly increased, while RI significantly decreased, compared with T0 values. During the NOR infusion, at T50 and T60, the EDV and VF significantly diminished with regard to T45, and the RI increased, with these parameters becoming similar to the values recorded at T0. From T45, PSV continuously increased compared with T0; however, the difference wasn’t significant and during this period it did not statistically change with respect to T45. The MV had a tendency to decrease at T50 (P < 0.093) and T60 (P < 0.052), compared to T45. When the NOR infusion ended, all hemodynamic parameters approached values previously recorded at T45 (Figures 4 and 5; Table 2).

The Doppler waveforms observed at T0 were biphasic, with a small spectral window and no reverse flow, which is characteristic of an intermediate resistance flow pattern. During systole, there was a sharp rise in flow velocity and a rapid decline toward baseline, and during diastole an oscillatory portion with alternating acceleration and deceleration of the antegrade blood flow. At T45, the waveforms matched a low resistance flow pattern, with a diastolic velocity higher than at T0, and a smaller Doppler shift on the initial alternating acceleration-deceleration phase. During the NOR infusion the Doppler curves indicated a smaller diastolic velocity, comparable to those from T0.
During the study, horses appeared sedated after ACP administration; those signs were absent during NOR infusion and reappeared after it, with less magnitude. None of the mares had excessively high arterial blood pressures or arrhythmias and all recovered uneventfully after completing the experimental protocol.

**Discussion**

The present study confirms the hemodynamic effects of intravenous ACP administration and reveals that NOR infusion at 1 µg/kg BW/min can reverse ACP’s vasodilatory effects, restoring hemodynamic parameters and blood pressure in a group of healthy adult horses. Throughout the study, the horses were tranquilized; however, as evaluation of sedation was not an objective, the study only evaluated the hemodynamic effect of ACP and NOR at the given doses.

Acepromazine’s vasodilatory properties can be expressed through a significant decrease in SAP and RI, and a significant increase in DIAM, CIRC, SURF, VF, PSV, EDV, and MV. In this study, such responses were observed during the period in which horses were exclusively under the effect of ACP, before, from T0 to T45, and after, from T45 onwards, NOR infusion. Results from our study are in agreement with those previously published and our study are in agreement with those previously published and the norepinephrine (NOR) infusion was administered at 1 µg/kg BW/minute. During the study, horses appeared sedated after ACP administration and revealed that NOR infusion progressively reversed ACP’s effect on the majority of parameters studied. Indeed, between T50 and T65, the SAP not only significantly increased after NOR infusion, but became higher than the values recorded at T0, which agrees with results previously reported in foals (15,18,28), dogs (17,29), sheep (20), and humans (30,31). The NOR infusion induced a significant increase in SAP for 15 min and then was progressively attenuated from T65 onwards. Based on clinical experience, similar reports have been cited with adult horses (15), and are in agreement with our results. As the values of SAP became higher during NOR infusion than at T0, we could question if the doses of NOR should be lower. To determine this, further studies could investigate the effect of different doses of NOR administered to horses under ACP premedication. During the period of NOR infusion, after T45, the CIRC and the SURF significantly decreased, from T45 to T60, and the DIAM from T45 to T60, proving there was an induced vasoconstriction and being in agreement with the significant diminution of EDV and the VF (32), while the increase in peripheral resistance was supported by an increase in RI (33). Besides, during NOR infusion, the PSV and the MV did not statistically change, with respect to T45, only MV had a tendency to decrease, from T50 to T60, which is also consistent with vasoconstriction (32). When analyzing changes in the morphology of Doppler waveforms during NOR infusion, with respect to T45, these are compatible with an augmentation in the vascular resistance, resulting in vasoconstriction. This effect can occur through augmentation of the oscillations, and consequent higher pulsatility waveform (27), or through a smaller diastolic velocity, and a greater amount of diastolic flow, which is consistent with peripheral vasodilation (26) and diminution of the Doppler shift following the systolic peak and lower pulsatility waveform (27).

Forty-five minutes after ACP administration, when all the signs of vasodilation were present in the horses, a 15-minute NOR infusion progressively reversed ACP’s effect on the majority of parameters studied. Indeed, between T50 and T65, the SAP not only significantly increased after NOR infusion, but became higher than the values recorded at T0, which agrees with results previously reported in foals (15,18,28), dogs (17,29), sheep (20), and humans (30,31). The NOR infusion induced a significant increase in SAP for 15 min and then was progressively attenuated from T65 onwards. Based on clinical experience, similar reports have been cited with adult horses (15), and are in agreement with our results. As the values of SAP became higher during NOR infusion than at T0, we could question if the doses of NOR should be lower. To determine this, further studies could investigate the effect of different doses of NOR administered to horses under ACP premedication. During the period of NOR infusion, after T45, the CIRC and the SURF significantly decreased, from T45 to T60, and the DIAM from T45 to T60, proving there was an induced vasoconstriction and being in agreement with the significant diminution of EDV and the VF (32), while the increase in peripheral resistance was supported by an increase in RI (33). Besides, during NOR infusion, the PSV and the MV did not statistically change, with respect to T45, only MV had a tendency to decrease, from T50 to T60, which is also consistent with vasoconstriction (32). When analyzing changes in the morphology of Doppler waveforms during NOR infusion, with respect to T45, these are compatible with an augmentation in the vascular resistance, resulting in vasoconstriction. This effect can occur through augmentation of the oscillations, and consequent higher pulsatility waveform (27), or through a smaller diastolic velocity (32), as observed.

Overall, once NOR infusion was completed, at T60, apart from CIRC and SURF, the rest of the parameters that varied during NOR infusion, returned to values similar to those at T45, when the only effect was vasodilation from ACP’s action.

### Table 1. Values for systolic arterial pressure (SAP) before (T0) and 45 minutes after (T45) administration of acepromazine (ACP), during continuous infusion of norepinephrine (NOR) between T45 and T60 and after NOR infusion, from T60. Results are given as mean ± SD

<table>
<thead>
<tr>
<th>Time ACP/NOR</th>
<th>SAP (mmHg)</th>
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<tbody>
<tr>
<td>T0</td>
<td>108.9 ± 11.24</td>
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<tr>
<td>T15</td>
<td>85.3 ± 5.31</td>
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<tr>
<td>T30</td>
<td>72.4 ± 6.68</td>
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<tr>
<td>T45</td>
<td>68.7 ± 7.39</td>
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<tr>
<td>T50</td>
<td>133.7 ± 24.98</td>
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<tr>
<td>T55</td>
<td>137.3 ± 20.77</td>
</tr>
<tr>
<td>T65</td>
<td>141.0 ± 19.53</td>
</tr>
<tr>
<td>T75</td>
<td>86.3 ± 11.27</td>
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<tr>
<td>T90</td>
<td>71.1 ± 9.31</td>
</tr>
<tr>
<td>T120</td>
<td>73.9 ± 9.52</td>
</tr>
<tr>
<td>T141</td>
<td>78.3 ± 5.97</td>
</tr>
</tbody>
</table>

Each value of SAP is significantly different (P < 0.05) from T0, if marked with * and from T45, if marked with †. The augmentation of VF has been associated with increases in the peripheral resistance (22), which are compatible with peripheral vasodilation (26) and diminution of the Doppler shift following the systolic peak and lower pulsatility waveform (27).

![Figure 3. Mean (± SD) of the variation percentage of the diameter (DIAM), circumference (CIRC) and surface (SURF) of the median artery before, during, and after norepinephrine infusion (NOR). At 0 minutes acepromazine at 0.1 mg/kg BW was administered intravenously; from 45 to 60 minutes the norepinephrine (NOR) infusion was administered at 1 µg/kg BW/minute. * significantly different from T0. † significantly different from T45.](image)
Consequently throughout a NOR infusion of 1 μg/kg BW/min the hypotension induced by ACP can be reversed.

Practically, the use of NOR to counteract hemodynamic effects of ACP may seem extreme, but results from our study provide equine clinicians and anesthesiologists a new clinical approach to counteract those effects, in particular in patients intolerant to ACP. To the authors’ knowledge the hemodynamic response on standing adult hypotensive horses to a NOR infusion has not been reported previously. As a consequence of α-adrenergic activity of NOR, which primarily causes vasoconstriction (13), the effects observed in the present study are those expected. Furthermore, the fact that no sign of epinephrine reversal was observed, following the concomitant administration of ACP and NOR, confirms the minor β₂-adrenergic receptor activation by NOR. Additionally the infusion of NOR not only reverted ACP’s α-adrenergic blocking effect, but also induced a significantly higher SAP compared with the baseline values. The present study appears to be the first to report such results, where there are no significant changes from the baseline of systemic arterial blood pressure, following the administration of a different α-adrenergic agonist drug, such as romifidine, subsequent to ACP’s administration, although romifidine is known to induce a transitory initial period of arterial hypertension (34).

The capacity of NOR to reverse ACP’s induced hypotension could eventually allow a better and more frequent use of ACP in the pre-anaesthetic medication protocol in some patients, permitting equine practitioners to take advantage of the protective effect of ACP during general anesthesia (35). Indeed, when horses from the same group at risk received an α₂-adrenergic receptor agonist for preanaesthetic medication, there was a reduction in the cardiac output (36). It would be of interest to evaluate the effect of using a reduced dose of preanesthetic α₂-adrenergic receptor agonist, concurrent with ACP administration, as an alternative protocol option in horses. This could be possible if NOR administration could be used to modulate the hypotensive and vasodilatory effects of ACP, although this administration would need to be closely monitored.

During the preliminary phase of this experiment, the same 5 mares that received an intravenous infusion of NOR at 1 μg/kg BW/min, without being premedicated with ACP, showed second degree atrioventricular blocks (2AVB). Although other types of arrhythmia can be linked to sympathetic activation (37,38), to the authors’ knowledge, the induction of 2AVB by NOR administration has not been reported. Additionally, when these mares were premedicated with ACP before the infusion of NOR, they developed a statistically lower

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Table 2. Values for surface (SURF), circumference (CIRC), diameter (DIAM), peak systolic velocity (PSV), end diastolic velocity (EDV), mean velocity (MV), volumetric flow (VF) and resistivity index (RI) of the left median artery with time, before (T₀) and 45 minutes after (T₄ₕ) administration of acepromazine (ACP), during continuous infusion of norepinephrine (NOR) between T₄ₕ and T₆₀ and after NOR infusion, from T₆₀. Results are given as mean ± SD

<table>
<thead>
<tr>
<th></th>
<th>T₀</th>
<th>T₄ₕ</th>
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<tr>
<td>ACP/NOR</td>
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<tr>
<td>DIAM (cm)</td>
<td>0.30 ± 0</td>
<td>0.39 ± 0.04</td>
<td>0.33 ± 0.04</td>
<td>0.327 ± 0.03</td>
<td>0.373 ± 0.07</td>
<td>0.393 ± 0.03</td>
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<tr>
<td>CIRC (cm)</td>
<td>1.13 ± 0.04</td>
<td>1.347 ± 0.05</td>
<td>1.18 ± 0.08</td>
<td>1.133 ± 0.06</td>
<td>1.193 ± 0.14</td>
<td>1.247 ± 0.09</td>
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<tr>
<td>SURF (cm)</td>
<td>0.085 ± 0.01</td>
<td>0.127 ± 0.03</td>
<td>0.095 ± 0.02</td>
<td>0.093 ± 0.02</td>
<td>0.107 ± 0.03</td>
<td>0.107 ± 0.02</td>
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<tr>
<td>PSV (m/s)</td>
<td>0.294 ± 0.06</td>
<td>0.427 ± 0.15</td>
<td>0.456 ± 0.24</td>
<td>0.440 ± 0.17</td>
<td>0.473 ± 0.14</td>
<td>0.482 ± 0.14</td>
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<tr>
<td>EDV (m/s)</td>
<td>0.041 ± 0.02</td>
<td>0.165 ± 0.07</td>
<td>0.095 ± 0.11</td>
<td>0.078 ± 0.08</td>
<td>0.148 ± 0.08</td>
<td>0.172 ± 0.09</td>
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<tr>
<td>MV (m/s)</td>
<td>0.095 ± 0.03</td>
<td>0.265 ± 0.15</td>
<td>0.159 ± 0.13</td>
<td>0.141 ± 0.08</td>
<td>0.330 ± 0.24</td>
<td>0.261 ± 0.09</td>
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<tr>
<td>VF (mL/min)</td>
<td>47.51 ± 14.93</td>
<td>202.47 ± 139.35</td>
<td>87.76 ± 61.43</td>
<td>76.86 ± 37.31</td>
<td>207.13 ± 152.92</td>
<td>166.02 ± 60.82</td>
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<tr>
<td>RI</td>
<td>0.864 ± 0.04</td>
<td>0.618 ± 0.04</td>
<td>0.825 ± 0.09</td>
<td>0.845 ± 0.08</td>
<td>0.699 ± 0.09</td>
<td>0.655 ± 0.12</td>
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</table>

Each value is significantly different (*P < 0.05) from T₀, if marked with * and from T₄ₕ, if marked with **.
frequency of 2AVB. It has been reported that ACP has the capacity to increase the arrhythmogenic dose of epinephrine (39), thus the ability of ACP to enhance the baroreceptor reflex (40), which mediates rapid changes in sympathetic and parasympathetic activity in response to changes in blood pressure (41), is most probably related to the ACP’s protective effect observed in this study. It is possible that the benefits of ACP are related to its α-adrenergic blocking effect and vasodilation; therefore, the NOR infusion, even when allowing a safer ACP administration to horses at risk, could reduce the beneficial properties induced by ACP. Studies are needed to investigate maintenance of the beneficial effects of ACP when administered with NOR, to counteract its hemodynamic effects.

In the present study, the use of Doppler ultrasonography proved to be sensitive enough to detect vascular and hemodynamic alterations in the standing horse, while evaluating the effect of drugs with opposite properties. These results help to confirm that Doppler ultrasonography can be successfully applied as a noninvasive technique to measure hemodynamic changes in horses with blood flow alteration disorders, and promote its use in studies to control the hemodynamic effects of treatments on the standing horse.

We conclude that a 15-minute continuous infusion of NOR at 1 μg/kg BW/min has the capacity to reverse the hypotension and vasodilation induced by ACP at 0.1 mg/kg BW, restoring hemodynamic parameters in healthy standing horses. In particular, the significant rise in SURF, DIAM, CIRC, PSV, EDV, MV, and VF and the reduction in RI and SAP which were significantly counteracted from T₅₀ to T₆₀ for EDV, VF, MV, and RI, and to T₅₀ for SAP, from T₅₀ to T₆₀ for CIRC and SURF, and from T₅₀ to T₆₀ for DIAM.

Acknowledgment
We thank Dr. Fabrice Péters for his contribution to this study.

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Book Review
Compte rendu de livre

Exotic Animal Medicine for the Veterinary Technician – 2nd edition


As a veterinarian with a passion for exotic animal medicine, I am all too aware of the range of challenges facing veterinarians wanting to work in this field. Exotic animal medicine is a relatively new area of specialization, and is evolving rapidly. It takes a concerted effort to keep on top of the latest trends. One of the things that has allowed me to continue pursuing my passion in my practice is having a skilled team of animal health technologists who share my love of all things weird and wonderful. It is for this reason that I was so excited to read this book, as I hoped it would prove to be a valuable resource for our staff.

The book is divided into sections on birds, reptiles, amphibians, exotic companion mammals, wildlife, and hematology. Each section is further subdivided into chapters, each covering a range of topics, including anatomy, physiology, husbandry, nutrition, common diseases, behavior, reproduction, restraint, parasitology, radiology, euthanasia, etc. The pictures within the chapters are in black and white, but many of them are also printed in color in the center of the book.

I was impressed with over-all quality of the information covered in the book; it is up-to-date and well-explained. I particularly enjoyed the avian chapters, which included excellent information on nutrition and behavior. The amphibian section has an excellent description of anesthetizing frogs with topical isoflurane, which I have seen discussed in other references, but never in such detail. The book presents a lot of very practical information. Most of the sections included diagrams of the locations of vessels for venipuncture, which is very much appreciated. In the wildlife chapter, there is a very useful section that simply covered what you should recommend on the phone when people find injured or orphaned wildlife, including tricks and tips on how to determine if an animal is actually orphaned. There are also extensive tables in the appendices of how to house and what to feed different wildlife species, and even how to tell nesting songbirds apart.

The one complaint I would have is that I found the lizard chapter a bit frustrating to read, as though the author was talking over my head. Given that the intended audience for this book are AHTs, I believe that this is a significant weakness. For example, the author would often give the scientific name of a species without listing the common name as well, which made it difficult to keep track of what species was being discussed. On page 95, the author mentions Heloderma spp. as being dangerous to humans, but never mentions anywhere in the chapter what the common name is, or why they are dangerous. This frustrated me, and I ended up having to search for this information elsewhere. Another thing I found a little odd is that in the parasitology portion of the chapter, there are a number of photo plates of different species of parasites. One of the photos is of a parasite named Nycototherus, but this parasite is not mentioned anywhere in the text. It is actually an interesting looking parasite, which I assume was part of the reason it was included, but it would have been nice to have a bit more information on the species it affects, and what the clinical symptoms associated with it are.

Over-all, I feel that this is a very useful reference, both for animal health technologists, and veterinarians. There are plenty of tables, diagrams, and pictures that would be helpful as a quick reference.

Reviewed by Teresa Bousquet, DVA, Park Veterinary Centre, Sherwood Park, Alberta T8H 2A8.
Case Report  Rapport de cas

Successful medical management of intra-abdominal abscesses in 4 adult horses

Dalia Berlin, Gal Kelmer, Amir Steinman, Gail A. Sutton

Abstract — Four adult horses with large intra-abdominal abscesses, suspected to be complications of strangles, were treated with systemic antibiotics alone and made a full recovery. The 100% survival rate is significantly better than other reported survival rates. The median duration of treatment (35 days) was shorter than in most previous reports. This study suggests that penicillin G can be used for successful treatment of strangles associated intra-abdominal abscesses in horses.

Résumé — Gestion médicale réussie d’abcès intra-abdominaux chez 4 chevaux adultes. Quatre chevaux adultes avec des abcès intra-abdominaux de grande taille, suspectés d’être des complications de la gourme, ont été traités seulement à l’aide d’antibiotiques systémiques et se sont rétablis complètement. Le taux de survie de 100 % est significativement meilleur que les autres taux de survie signalés. La durée médiane du traitement (35 jours) a été plus courte que celle indiquée dans la plupart des rapports antérieurs. Cette étude suggère que la pénicilline G peut être utilisée avec succès pour le traitement des abcès intra-abdominaux associés à la gourme chez les chevaux.

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Intra-abdominal abscesses in adult horses are potentially life-threatening. Abscesses may develop insidiously but can eventually rupture and cause fatal septic peritonitis. Known etiologies of abdominal abscessation in adult horses include hematogenous or lymphatic bacterial spread, gastrointestinal perforation, previous intestinal surgery, and ulceration (1). Abdominal abscesses have been described in the liver, mesenteric lymph nodes, kidney, spleen, uterus, bladder, intestine, and abdominal wall (2). Adhesions involving the abscess within the abdominal cavity may further complicate the condition. Several species of bacteria have been associated with abdominal abscesses in adult horses including Streptococcus spp., Corynebacterium spp., Bacteroides spp., Clostridium spp., and Escherichia coli (1,3). One of the most common causes of abdominal abscessation in adult horses is the hematogenous spread of Streptococcus equi subsp. equi from the respiratory tract to the mesenteric lymph nodes as a complication of strangles known as “bastard strangles” (2).

The diagnosis of abdominal abscesses in the horse may be challenging due to their anatomical location and the non-specific clinical signs. Diagnosis is usually based on rectal palpation, ultrasound (trans-abdominally or trans-rectally) images, abdominal fluid analysis, hematology, and surgery (1). Treatment options include systemic antimicrobial treatment alone or combined with surgical intervention (1). In both options, several weeks of systemic antimicrobial treatment are usually required. The survival rate reported in the literature varies between 24.6% to 80% and is apparently related to the presence of complications such as adhesions and the severity of the inflammatory response, determined by fibrinogen levels (4–7).

The purpose of this study is to describe the successful medical management of 4 adult horses with large intra-abdominal abscesses.

Case descriptions

Case 1
A 2.5-year-old Quarter horse mare weighing approximately 350 kg was presented at the Koret School of Veterinary Medicine Veterinary Teaching hospital (KSVM-VTH) due to colic, peritonitis, and a suspected intra-abdominal mass. A month earlier the mare had exhibited clinical signs which were attributed to strangles and included purulent nasal discharge, fever, lymphadenopathy, and a suspected intra-abdominal mass. A month earlier the mare had exhibited clinical signs which were attributed to strangles and included purulent nasal discharge, fever, lymphadenopathy, and a suspected intra-abdominal mass. A month earlier the mare had exhibited clinical signs which were attributed to strangles and included purulent nasal discharge, fever, lymphadenopathy, and a suspected intra-abdominal mass. A month earlier the mare had exhibited clinical signs which were attributed to strangles and included purulent nasal discharge, fever, lymphadenopathy, and a suspected intra-abdominal mass. A month earlier the mare had exhibited clinical signs which were attributed to strangles and included purulent nasal discharge, fever, lymphadenopathy, and a suspected intra-abdominal mass.
mid-cranial aspect of the abdominal cavity. Blood tests revealed leukocytosis (17.6 × 10^3/μL; reference interval (RI): 5.4 to 14.3 × 10^3/μL), mild anemia (packed cell volume, PCV: 22%; RI: 32% to 53%), and elevated total solids (TS: 86 g/L; RI: 55 to 75 g/L). Abdominocentesis revealed turbid fluid (TS: 62 g/L, reference value: < 25 g/L) with abundant neutrophils with no visible bacteria on cytology. The mare was treated with intravenous fluids, water, and mineral oil via nasogastric tube, and flunixin meglumine (Flunixin Injection: Norbrook, Lenexa, USA), 0.5 mg/kg body weight (BW), IV, and was referred to the hospital for further diagnosis and treatment.

### Case 2
A 3-year-old Quarter horse gelding weighing 377 kg was presented at the KSVM-VTH due to colic and suspected intra-abdominal mass. Two months prior to referral the horse suffered from strangles, was treated with procaine penicillin G (unknown dosage and duration), and apparently recovered. Three weeks prior to referral the horse exhibited several episodes of fever that were treated symptomatically with flunixin meglumine. A week later, the fever continued and the horse became depressed, lost weight, and suffered from intermittent colics and bruxism that did not improve with H2-receptor blocker (ranitidine) treatment. Prior to referral, blood tests revealed leukocytosis (20.1 × 10^3/μL), mild anemia (PCV: 27%), thrombocytosis (357 × 10^3/μL; RI: 70 to 250 × 10^3/μL), hyperproteinemia (87 g/L; RI: 57 to 79 g/L), hyperglobulinemia (58 g/L; RI: 26 to 40 g/L), with elevated lactate dehydrogenase (1956 U/L; RI: 14 to 570 U/L), and alkaline phosphatase (900 U/L; RI: 90 to 400 U/L) concentrations. Other parameters (albumin, aspartate aminotransferase, gamma-glutamyltransferase, urea, creatinine, chloride, potassium, sodium, and calcium) were within the normal ranges. Three days prior to referral, a mass in the mid-cranial abdomen was palpated rectally. Procaine penicillin G (Norocillin, Norbrook), 25 000 IU/kg BW, IM, q12h, was administrated for 3 d before a severe episode of colic developed at which time the horse was referred to the hospital.

### Case 3
An 8-year-old Quarter horse mare, 4 months pregnant, weighing 470 kg was presented at the KSVM-VTH due to peritonitis. One of the other 5 horses residing on the same farm suffered from a sub-mandibular abscess 6 wk prior to referral that was suspected to have been caused by a foreign body, but this had resolved spontaneously without any other clinical signs. Three weeks prior to referral the mare became depressed, quiet, and

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### Table 1. Selected clinical and laboratory findings, and treatments during hospitalization of 4 horses with abdominal abscesses

<table>
<thead>
<tr>
<th>Case</th>
<th>Physical examination</th>
<th>Findings on rectal palpation</th>
<th>Abdominal fluid analysis</th>
<th>Hematology</th>
<th>Treatment and Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>T-38.1, P-56, R-8</td>
<td>A firm mass in the mid-cranial aspect, 15 to 20 cm in diameter</td>
<td>WBC-190</td>
<td>°WBC-16</td>
<td>SPG 15 × 10^6 IU for 3 d</td>
</tr>
<tr>
<td></td>
<td>Pink MM, reduces GIT sounds</td>
<td>A firm, rough mass in the mid-cranial aspect, 20 cm in diameter</td>
<td>TS-60</td>
<td>PLT-357</td>
<td>PPG 6 × 10^5 IU for 5 d</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Negative culture</td>
<td>Abundant neutrophils, reactive macrophages, no bacteria</td>
<td></td>
<td>Total: 36 d</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>°WBC-20.1</td>
<td>36 g/kg BW , IV , q12h for 3 d</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCV-28, TS-92</td>
<td>0.5 mg/kg BW , IV , q12h for 3 d</td>
</tr>
<tr>
<td>2</td>
<td>T-38.2, P-48, R-40</td>
<td>A firm mass in the mid-cranial aspect, 20 cm in diameter</td>
<td>TS-40</td>
<td>PLT-357</td>
<td>Flunixin meglumine 0.5 mg/kg BW, IV, q12h for 3 d</td>
</tr>
<tr>
<td></td>
<td>Pink MM, normal GIT sounds</td>
<td>A firm mass in the mid-cranial aspect, 20 cm in diameter</td>
<td>Abundant neutrophils, reactive macrophages, no bacteria</td>
<td></td>
<td>Total: 34 d</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCV-27, TS-82</td>
<td>4 mg/kg BW , IV , q12h for 2 d</td>
</tr>
<tr>
<td>3</td>
<td>T-36.6, P-36, R-16</td>
<td>A firm mass in the right-cranial aspect, 25 cm in diameter</td>
<td>TS-65</td>
<td>PLT-294</td>
<td>Flunixin meglumine 0.5 mg/kg BW, IV, q12h for 3 d</td>
</tr>
<tr>
<td></td>
<td>Pink MM, reduced GIT sounds, pain on external abdominal palpation</td>
<td>Abundant pyknotic neutrophils, no bacteria</td>
<td>TS-28</td>
<td>PCV-36, TS-89</td>
<td>Total: 34 d</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCV-26, TS-63</td>
<td>4 mg/kg BW , IV , q12h for 3 d</td>
</tr>
<tr>
<td>4</td>
<td>T-37.6, P-36, R-12</td>
<td>Slightly dehydrated, mild icterus and prolonged CRT</td>
<td>TS-28</td>
<td>°WBC-15.4</td>
<td>Flunixin meglumine 0.5 mg/kg BW, IV, q12h for 3 d</td>
</tr>
<tr>
<td></td>
<td>Slightly dehydrated, mild icterus and prolonged CRT</td>
<td>Abundant pyknotic neutrophils, no bacteria</td>
<td>TS-28</td>
<td>PCV-26, TS-63</td>
<td>Total: 34 d</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>°WBC-15.4</td>
<td>4 mg/kg BW , IV , q12h for 3 d</td>
</tr>
</tbody>
</table>

### Notes

1. On presentation.
2. On the day prior to referral.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
<th>Case 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pack cell volume (%)</strong></td>
<td>34, TS: 80</td>
<td>34, TS: 80</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td><strong>Total solids (g/L)</strong></td>
<td>34, TS: 80</td>
<td>34, TS: 80</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td><strong>Platelet count (x 10^3/μL)</strong></td>
<td>182, TS: 50</td>
<td>182, TS: 50</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td><strong>White blood cell count (x 10^3/μL)</strong></td>
<td>10.4, PCV: 34, TS: 84</td>
<td>7.6, PCV: 30, TS: 60</td>
<td>10.0, PCV: 30, TS: 80</td>
<td>10.0, PCV: 30, TS: 80</td>
</tr>
<tr>
<td><strong>Sodium penicillin G (mg/kg BW)</strong></td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Procaine penicillin G (mg/kg BW)</strong></td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Ranitidine (mg/kg BW)</strong></td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>
had reduced appetite which did not improve with teeth floating. Blood tests prior to referral revealed mild leukocytosis (14.75 × 10⁹/μL), mild anemia (PCV 29%), hypoaalbuminemia (18 g/L; RI: 26 to 41 g/L), and hyperglobulinemia (55 g/L). The mare was treated for several days with an oral iron supplement and trimethoprim-sulfadiazine, which was subsequently replaced with procaine penicillin G and enrofloxacin (unknown doses). No improvement was observed and on the day prior to referral the referring veterinarian noticed pain on external palpation of the abdomen with no abnormal findings on rectal palpation. Abdominocentesis revealed turbid fluid with elevated total solids (TS: 65 g/L) and marked leukocytosis (97.5 × 10³/μL; reference value: < 10 × 10³/μL). Microscopic examination of the abdominal fluid revealed mainly mature neutrophils, occasional lymphocytes, and reactive monocytes, with no visible bacteria. The horse was referred to the KSVM-VTH due to colic and a suspected intra-abdominal mass. The horse had suffered from strangles for several years after recovery and then for pleasure riding.

The mare was referred to the hospital on the following day.

**Case 4**

A 4-year-old Thoroughbred-cross gelding, weighing 370 kg, was referred to the KSVM-VTH due to colic and a suspected intra-abdominal mass. The horse had suffered from strangles as a yearling and had recovered. Two months before presentation, the horse was moved to a new farm where an outbreak of strangles was ongoing; however, he did not seem to develop any of the characteristic clinical signs of strangles. Two weeks prior to referral, the horse exhibited signs of intermittent colic and episodes of mild fever that responded favorably to treatment with flunixin meglumine. Two days prior to referral the colic signs worsened. On the day of referral the attending veterinarian treated the horse with water and mineral oil via a nasogastric tube and with intravenous fluids. On rectal palpation, a firm mass was palpated on the cranial right side of the abdomen and the horse was referred to the hospital.

Table 1 summarizes the findings of the physical examination, rectal palpation, abdominal fluid analysis, and selected blood parameters on presentation at the hospital.

Rectal ultrasound imaging of the abdominal mass revealed a hyperechoic outer layer (capsule) in all cases and either a hypoechoic single distinct interior cavity (Cases 1, 2, and 4) or several cavities (Case 3). These findings combined with the evidence of peritonitis were consistent with the diagnosis of intra-abdominal abscesses. In all cases, the etiology of the abscesses was considered to be a complication of strangulation (metastatic abscessation or bastard strangulation) based on the history of typical clinical signs of strangulation in the horse itself (Cases 1 and 2) or in other horses on the same farm (Cases 3 and 4).

In all cases, the location of the abscess, at the cranial aspect of the abdominal cavity was suspected as being in the mesenteric root thus surgical drainage was not considered a safe option. Medical treatment with long-term intravenous antibiotic was chosen as an alternative option. Due to the presumptive diagnosis of *S. equi* subsp. *equi* infection, all horses were hospitalized in the isolation unit, and the antibiotic treatment of choice was penicillin. Sodium penicillin G (Sodium penicillin G; Sandoz, Kundl, Austria) was initially given intravenously at a high dose (40 to 44 000 U/kg, 4 times a day). The dose was then reduced to 20 to 25 000 U/kg (Cases 2–4) or replaced by procaine peni-
was referred to the KSVM-VTH due to acute colitis and colic. The presumptive cause for the colitis was a change in the type of hay that was fed on the farm (several other horses had concurrent, self-limiting, mild diarrhea). The horse was euthanized after 2 d due to severe, unresponsive colic. On postmortem examination there was no evidence of the abdominal abscess or intra-abdominal adhesions. The diagnosis was of acute necrotizing colitis. Bacteriologic culture was not available.

The mare in Case 3 went on to deliver a normal foal, returned to the former level of pleasure riding and was still doing well 4 y after discharge. The horse in Case 4 returned to the former level of pleasure riding and was reported to be doing well 1.5 y after discharge.

The presented study reports a 100% (95% confidence interval (CI): 40 to 100) survival rate in 4 horses treated for an intra-abdominal abscess with systemic antibiotic alone. Since no other cases in which abdominal abscesses were suspected were admitted to the hospital during the time period of the current study, this survival rate is accurate for this time period. Therefore, although the study sample is small and only 4 cases were reviewed, the prognosis is significantly more favorable than previously reported (Fisher’s exact test, \( P < 0.05 \)). A recent study of 6 horses treated by surgical drainage of abdominal abscesses reported a survival rate of 67% (95% CI: 22 to 96) (4), which is similar to the rate of 68% (17/25, 95% CI: 47 to 85) reported by Rumbaugh et al (7). A brief report of 61 cases, which does not specify the mode of treatment used, reported the extremely low survival rate of 24.6% (95% CI: 14 to 37) (5). Pusterla et al (6) reported survival of 60% (6/10, 95% CI: 26 to 88) of horses treated with systemic antibiotics for an extended period of time. A possible reason for the difference in the survival rate between this study and the cases presented here could be the severity of the presenting clinical signs. Three of the horses in the report by Pusterla et al (6) were euthanized within 3 days of presentation due to severe colic or financial considerations.

The diagnosis of abdominal abscesses was based on rectal palpation, rectal ultrasound, and abdominocentesis. Since none of the horses had exploratory celiotomy and no postmortem examinations were initially available, there was no definitive diagnosis. However, the ultrasonographic appearance of a soft tissue mass with a fluid-filled cavity, in all horses, was highly suggestive of an abscess. Furthermore, the history of a recent respiratory tract infection suspected as strangles in 2 of the horses (Cases 1 and 2) and the exposure to suspected strangles infected horses in the other 2 horses (Cases 3 and 4) were highly suggestive of \( S.\ equi \) subsp. \( equi \) metastatic abscessation. The main differential diagnosis is abdominal neoplasia and although the differentiation between abdominal abscesses and neoplasia can be challenging (8), the positive response to the antimicrobial treatment and the full recovery of all the horses further support the diagnosis.

The treatment choices for abdominal abscesses in adult horses include surgical excision, surgical drainage followed by long-term systemic antibiotics, and systemic antibiotic treatment alone (1). In the cases presented here, the location of the abscesses was considered difficult to approach surgically and the potential for severe complications such as spillage of the abscess content into the abdominal cavity led to the decision to avoid surgical intervention. Existing adhesions may be a reason for surgical treatment in cases of abdominal abscessation, but clinically significant adhesions were not suspected in the horses in this study at the time of presentation.

The antimicrobial drug of choice in all cases was sodium penicillin G. The choice was based on the working diagnosis of bastard strangles in all 4 cases. Penicillin is not routinely used to treat abscesses due to suggested impaired tissue penetration (9). In previous reports, ceftiofur, rifampin, potentiated sulfonamides, chloramphenicol, gantamicin, and metronidazole were used (1,3,6,10,11). However, Ensink et al (12) demonstrated good penetration of procaine penicillin G (20 000 IU/kg, every 24 h, for 21 d) into subcutaneous chambers in ponies and elimination of \( S.\ equi \) subsp. \( zooepidemicus \) that was introduced into the chambers. Based on that study, penicillin G may have better tissue penetration than previously perceived. Furthermore, its efficacy in the presence of purulent material was also proven (12). Even though the study by Ensink et al (12) demonstrated the good penetrating ability of a standard dose of penicillin G, in the cases presented here, a high dose of intravenous sodium penicillin G was administered initially (44 000 IU/kg), to ensure enhanced tissue penetration and inhibit the maturation of the abscess and thus avoiding rupture and spillage into the abdominal cavity. The gradual reduction in the size of the abscesses and the full recovery achieved in all the described cases further demonstrate the ability of penicillin G to penetrate abscesses in clinical cases. It is possible that a regular dose of penicillin G could have been sufficient. The postmortem examination of the horse in Case 2, which died of an unrelated cause several months after discharge, revealed complete resolution of the abscess.

The median duration of antimicrobial treatment (35 d) in this study was considerably shorter than in most previous studies. A median of 47 d with a range of 42 to 52 d was described by Mair and Sherlock (4), a mean of 72 d (30 to 131 d) was recorded by Pusterla et al (6), and a single case reported by Aleman et al (3) was treated for 3 mo. A shorter duration (29 d) was described in a single case reported by Mogg and Rutherford (11). The shorter duration of treatment in our study may have resulted from the beneficial properties of the penicillin itself or from the use of the high dose during most of the treatment period.

Recently, Mair and Sherlock (4) described the surgical drainage of abdominal abscesses in 6 horses. Their choice of treatment was based partially on their experience that large abscesses do not respond favorably to antibiotic treatment alone. The current study showed that large abscesses, 15 to 25 cm in diameter, could in fact be resolved with medical treatment alone thus rendering this treatment a reasonable option to consider even with large abscesses. It is possible that the favorable outcome in the described cases was related partly to the absence of other complications such as significant adhesions which warrant an unfavorable prognosis and the confinement of the abscesses to the root of the mesentery with no involvement of other organs.

In conclusion, based on the experience described here, we believe that medical management of suspected cases of bastard strangles is a viable option regardless of the size of
the intra-abdominal abscess, especially in cases where significant abdominal adhesions are not suspected or diagnosed. Furthermore, the favorable outcome and the relatively short duration of treatment support the use of intravenous sodium penicillin G.

References

Book Review
Compte rendu de livre

Breed Predispositions to Disease in Dogs and Cats – 2nd edition


Purebred dogs can present various dilemmas to practicing veterinarians. One area in which we can look incompetent is with regard to inherited diseases in certain breeds, especially rare ones. It isn’t uncommon to have an owner come in with rare (and of course oh-so valuable) breed “x” with a rare condition “y” (which of course everyone who deals with this exciting breed knows about). In many cases the first problem is that we don’t recognize the dog as being breed “x,” to us it merely looks like a not very pretty mutt, but then beauty is in the eye of the beholder. The other issue is keeping abreast of all these breed-specific problems, which is where this book can be an invaluable resource. It won't help in breed identification (that is what Wikipedia is for), but it will give you a rundown of diseases the breed can have (ever heard of trapped neutrophil syndrome in border collies, ocular melanosis in Cairn terriers, or Burmese head defect??). The list of diseases is quite exhaustive and is divided into groups or conditions such as neurological, ocular, neoplastic, physiological, GI, musculoskeletal, reproductive, respiratory, cardiovascular, endocrine, and hematological/immunological. The list for each breed varies in length but can be very extensive, for instance in the West Highland white terrier the list of 31 conditions is almost 3 pages long. Each condition has some short bullet points to go along with it, in most cases with a reference provided. The list of dog and cat breeds is also quite long, some breeds I haven’t seen and some I have never even heard of (Alaskan Klee Kai, Boerboel, McNab shepherd to mention just a few).

Given the information provided, this book is also ideal for owner education, especially those owners looking to obtaining a new pet. This text will allow you to provide objective information to clients with regard to what potential problems are seen in a particular breed; thereby enabling strategies to be developed that will minimize the impact of genetic disease in the patient or allow early identification.

The final section of the book is devoted to the more common diseases. These write-ups are very short, usually only a short paragraph so they will not suffice to gain a clear understanding of the condition but are a good starting point. The reference list is extensive and provides a current list of articles regarding various breed-related disorders.

I certainly think this book is a great reference to have in practice; it probably is a good idea to have it close to the examination room so that you can quickly sneak out and take a peek to see what diseases breed “x” can be predisposed to and what disease “y” actually is, thereby making you look like a really smart vet.

Reviewed by Anthony P. Carr, DVM, DACVIM (small animal internal medicine), Professor, Small Animal Clinical Sciences, Western College of Veterinary Medicine, Saskatoon, Saskatchewan.
Case Report  Rapport de cas

Free proximal cortical ulnar autograft for the treatment of distal radial osteosarcoma in a dog

Esteban Gonzalez Gasch, Pablo Rivier, Jean François Bardet

Abstract — This report describes the use of a non-vascularized proximal cortical autograft from the ipsilateral ulna in limb-sparing surgery for the treatment of distal radial osteosarcoma. A pancarpal arthrodesis was performed to stabilize the site. Construct failure and probable local tumor recurrence were observed. The total survival time was 282 days.

Résumé — Autogreffe cubital cortical proximal libre pour le traitement d’un ostéosarcome radial distal chez un chien. Ce rapport décrit l’utilisation d’un autogreffe cortical proximal non vascularisé du cubitus ipsilatéral lors d’une chirurgie visant à épargner un membre pour le traitement d’un ostéosarcome distal radial. Une arthrodèse pancarpienne a été réalisée pour stabiliser le site. Une défaillance du modèle et une récurrence locale probable de la tumeur ont été observées. La durée de survie totale a été de 282 jours.

Osteosarcoma (OSA) is the most common primary neoplasm of the canine skeletal system, accounting for up to 85% of bone tumors. The distal radius and proximal humerus are the 2 most common locations (1). Current treatment protocols are based on a combination of surgery (limb amputation or limb salvage) and adjuvant chemotherapy. There is no significant difference in survival rates between limb-salvage procedures and limb-amputation surgery when combined with adjuvant chemotherapy (1). Limb-sparing surgery is a viable alternative to limb amputation in dogs, especially if there is severe pre-existing orthopedic or neurological disease or if owners are opposed to limb amputation (1).

The purpose of this report is to describe a new limb-sparing technique involving the use of a free proximal cortical autograft from the ipsilateral ulna for the treatment of distal radial OSA in a dog. Cortical allografts (CA) have traditionally been used in limb-sparing surgeries of distal radial OSA (1). Several other limb-sparing methods have been developed in recent years. Reported techniques include pasteurized (2) or irradiated autografts (3), endoprosthesis (4,5), vascularized ulnar transposition graft (6), stereotactic radiosurgery (7), and longitudinal (8) or transverse (9) bone transport osteogenesis. All these techniques are often associated with a high complication rate including infection, construct failure, and tumor recurrence (1,4).

CASE DESCRIPTION

A 4-year-old male great Dane dog (75 kg) was referred to our practice with a 2-week history of right forelimb lameness with an acute onset and an unknown origin. Lameness was obvious and the dog was weight-bearing at walk, but non-weight-bearing at trot. Physical and orthopedic examination revealed an antecubital swelling on the right forelimb, with pain on flexion and extension of the carpus. Radiography of the right forelimb revealed a mixed pattern of osteolysis and osteoproliferation on the distal third of the radius, with no apparent lesions in the distal ulna (Figure 1). The differential diagnosis for this mixed pattern bone lesion includes osteomyelitis (bacterial or fungal), metastatic bone disease, bone cysts, and primary bone tumor (1). Based on the history, signalment, lesion location, and radiographic findings, a primary bone tumor was suspected. Preoperative bone biopsy was not performed to i) avoid tumor seeding into adjacent soft tissue, and ii) decrease the risk of pathological fracture (1). Fine-needle aspiration (FNA) of the distal radial lesion was not attempted. No abnormalities were detected on preoperative 3-view thoracic radiographs, abdominal ultrasound, echocardiography, urinalysis, and blood tests [complete blood (cell) count (CBC) and biochemistry]. Treatment options discussed with the owners included chemotherapy alone and amputation or limb-sparing surgery in conjunction with chemotherapy; they elected to proceed with the latter.

The dog was premedicated with acepromazine (Vettranquil; CEVA, Libourne, France), 0.05 mg/kg body weight (BW), IM, morphine (Cooper; Melun, France), 0.3 mg/kg BW, IM, and meloxicam (Metacam; Boehringer Ingelheim, Reims, France) 0.2 mg/kg BW, SQ. Anesthesia was induced with propofol (Diprivan; AstraZeneca, Caponago, Italy), 4 mg/kg BW, IV, to effect, and maintained under isoflurane (Isoflurane Belamont;
Nicholas Piramal, Mumbai, India) and oxygen. Cephalexin (Rilexine; Virbac, Carros, France), 22 mg/kg BW, IV, was administered 30 min before induction and then every 90 min during surgery.

The dog was positioned in dorsal recumbency and a dorsal approach to the radius and carpus was performed. Caudally, the tumor was closely attached to the distal ulna. The tumor was not dissected caudally to avoid penetration. The extensor carpi radialis muscle and the common and lateral digital extensor tendons were transected proximal and distal to the tumor. An oscillating saw was used in both radial and ulnar osteotomies. The level of the transverse osteotomy of the radius, 3 cm proximal to the tumor, was determined on radiographs and confirmed by gross intraoperative evaluation (10). The ulna was osteotomized at the same level as the radius. The radius was disarticulated at the antebrachiocarpal joint and the tumor removed en bloc with the distal ulna.

The proximal aspect of the radial carpal bone was removed using an oscillating saw to provide a flat surface for pancarpal arthrodesis. The resected radial bone segment was measured and a second ulnar osteotomy performed proximally using a separate blade to yield the same length of bone, via the same dorsal approach. The length of the resected radio-ulnar segment was 9 cm, including the 3-cm free margins (this represented 35% of the total radial length). The free proximal cortical ulnar autograft (FPCUA) was then positioned in the radial defect. There was a slight incongruence between the FPCUA and the distal extremity of the proximal radius (Figure 2A). The FPCUA was stabilized using a 16-hole 4.5-mm dynamic compression plate (DCP; Synthes GmbH, Zuchwil, Switzerland). The plate was positioned cranially and secured to the proximal radius with 4 cortical bone screws. Four cortical bone screws were also used in the FPCUA. Five cortical bone screws were inserted distally: 1 in the radial carpal bone and 4 in the third metacarpal bone. Fifty percent of the length of the third metacarpus was covered by the plate (11). A second 15-hole 4.5-mm DCP plate (Synthes GmbH) was positioned craniolaterally to increase the rigidity of the entire construct and thus improve the stability of the

Figure 1. A – Preoperative mediolateral radiograph. B – Preoperative craniocaudal radiograph. Note the osteolysis and osteoproliferation on the distal third of the radius without apparent involvement of the ulna.

Figure 2. A – Immediate postoperative mediolateral radiograph. Note the FPCUA stabilized with 4 screws and the slight incongruence between the proximal FPCUA and distal extent of proximal radius (arrow). B – Immediate postoperative craniocaudal radiograph.
FPCUA. Four cortical bone screws were used proximally in the radius and 4 cortical bone screws were used distally, 3 of which were placed in the fourth metacarpal bone, covering 30% of its length (Figure 2). Subcutaneous tissue and skin were closed routinely. The limb was protected with a modified Robert Jones bandage for 15 d. All plates were pre-bent to provide a 10° extension of the antebrachiocarpal joint.

Postoperative analgesia consisted of subcutaneous morphine (0.5 mg/kg, BW, SQ every 4 to 6 h, as needed) and oral meloxicam (Metacam 2.5; Boehringer Ingelheim, Reims, France), 0.1 mg/kg BW, q24h for 48 h. The dog was discharged, with oral tramadol for 7 d (Tramadol LP Sandoz), 4 mg/kg BW, PO, q8 to 12 h; and oral meloxicam (same dosage) for 15 d. Oral cepalexin (Rilexine 600 mg; Virbac), 22 mg/kg BW, q8h was administered for 2 wk and exercise was restricted to short walks on a leash for 8 wk. The dog was re-examined 2, 3, 6, and 9 mo after the surgery. Thoracic and limb radiographs and limb function were evaluated at each examination.

The histopathological diagnosis of the excised bone confirmed a grade II fibroblastic osteosarcoma (OSA) without ulnar involvement, but soft tissue extracompartamental presence (stage IIB). Surgical resection was considered complete with no evidence of neoplasia at the radial osteotomy site. An alternating protocol of doxorubicin (30 mg/m²) and carboplatin (300 mg/m²) was planned every 3 wk for a total of 6 treatments (12). The first treatment was started 2 wk after surgery. A CBC was taken 2 wk after each carboplatin administration; serum biochemistry was performed every 2 mo, and an echocardiogram was done during the visit of the last treatment. There was no evidence of gastrointestinal upset, myelosupression, or cardiotoxicity during or after chemotherapy.

Lameness was subjectively graded as absent, mild, moderate, or severe depending on the degree of weight-bearing on the operated limb. Lameness was graded as mild if weight-bearing and not present at walk or trot; moderate if the lameness was weight-bearing and present at all paces; and severe if non-weight bearing. Limb function was considered excellent if lameness was absent, good with mild lameness, and poor if lameness was either moderate or severe (3,13). Lameness progressively improved from toe-touching 2 d after surgery to full weight-bearing without visible lameness at walk or trot 2 mo after surgery. Three months after surgery lameness was still mild with good limb function, without any significant changes on limb.

**Figure 3.** A – 6-month postoperative (PO) mediolateral radiograph. There is loosening of the most distal and the most proximal screws on the third metacarpal bone. Note the radiolucent line around the 4 screws of the FPCUA (arrowheads). B – 6-month PO craniocaudal radiograph. Note the mild osteoproliferation on the proximal radius (arrows).

**Figure 4.** A – 9-month postoperative (PO) mediolateral radiograph. Note the loosening of the second and third proximal FPCUA screws (arrowheads). B – 9-month PO craniocaudal radiograph. There is marked osteoproliferation (sunburst pattern; arrows), compatible with tumor recurrence or osteomyelitis.
palpation and on limb and thoracic radiographs. Six months after surgery, although lameness was still mild with good limb function, some signs of early construct failure were observed. The most distal and the most proximal screw on the third metacarpal bone were loose and a radiolucent line was observed around all 4 screws in the FPCUA, indicating micromotion. Moderate osteoproliferation was observed on the plate on the proximal radius and some cortical resorption was observed on the distal third of the FPCUA, suggesting an osteomyelitis (Figure 3). A FNA with a culture was not done because there were no detectable signs of infection in the operated limb (no fistulas or soft tissue swelling). Implant revision was not performed due to good limb function.

Nine months after surgery, the dog was admitted with a 2-day history of progressive weakness. Abdominal ultrasound revealed effusion, which was confirmed as a hemoabdomen on abdomino-ocentesis. The spleen was enlarged with several hypoechoic nodules scattered throughout the splenic and hepatic parenchyma. On exploratory laparotomy, a 4-cm splenic nodule was found to have ruptured. Multiple nodules were disseminated in all hepatic lobes. Splenic hemangiosarcoma (HSA) with hepatic metastasis was diagnosed on histological examination following splenectomy and hepatic biopsy. Thoracic radiography and palpation of regional lymph nodes did not provide evidence of metastases. Echocardiography was within normal limits. Doxorubicin chemotherapy (30 mg/m^2, IV) was begun 1 wk after surgery. A whole fresh blood transfusion was performed, and the dog was discharged 3 d after the splenectomy.

Prior to this episode, the owner told us that lameness was not present at walk, and they considered that the dog had good limb function. Osteoproliferation radiating from the proximal radial cortex had been progressing in a sunburst pattern, suggestive of local tumor recurrence or a severe osteomyelitis (Figure 4). The FPCUA was more radiolucent and 2 screws had become looser (the second and third screw in the FPCUA from proximal to distal; Figure 4). Implant revision or diagnostic surgery was not considered on account of the poor prognosis associated with the splenic and hepatic HSA and in light of the good limb function. Two weeks after the splenectomy, the dog was readmitted for recurrent hemoabdomen, presumably following the rupture of a hepatic nodule. The dog was euthanized. The owners declined necropsy. The total survival time was 282 d.

Discussion

The use of a free cortical ulnar autograft from the mid-ulnar diaphysis has been described previously to stabilize a segmental mandibulectomy performed to remove an ossifying epulis (14). The distal aspect of the ulna has also been used successfully as a free (15) or rotational vascularized cortical autograft (6). To the authors’ knowledge, this is the first description of a non-vascularized proximal cortical autograft from the ipsilateral ulna for limb-sparing surgery of a distal radial OSA.

The advantages of FPCUA include the ready availability of the graft with no need for special equipment, bone-banking facilities, or external beam radiation therapy. Dogs with pre- or intra-operative evidence of tumor extension into the distal ulna can still be good candidates, since the technique allows the en bloc removal of the distal ulna. Liptak et al. (4) demonstrated that preservation of the ulna is not required in an endoprosthesis model for limb-sparing of the distal radius for improved stability in axial compression. Whereas some techniques require cumbersome postoperative management (longitudinal and transverse bone bone transposition), FPCUA was easier to manage in this case. Furthermore, the length of the FPCUA can be adjusted to fit the radial segment, providing there is sufficient remaining ulnar length after ulnar ostectomy. The lack of vascularization could have made the graft more susceptible to infection, but we did not observe any physical sign of infection on the FPCUA, despite 6- and 9-month radiographic signs. The 9-month post-operative radiographs showed intense periosteal remodelling with a sunburst periosteal pattern, which is more typical of a neoplastic etiology. However, we cannot exclude osteomyelitis. A FNA or a bone biopsy and a culture should have been done, but they were not performed at that time because of the good limb function and because there was no external sign of infection.

Accurate preoperative assessment of the proximal extent of the tumor is essential when selecting candidates for limb-sparing; the best candidates are those with small tumors (<40% of radius involvement including 3-cm tumor-free margins, as it was in our case). Radiography can be an accurate method for measuring the margins (10); however, a computed tomography (CT) scan could have been useful for determining tumor length. An FPCUA requires permanent internal fixation, because the non-vascularized autograft will never be fully incorporated. Allograft non-union is relatively common in canine limb-sparing surgery. The clinical impact of non-union is usually minimal since the allograft-host bone interface is rigidly stabilized and protected with a plate (1).

Construct failure in this case was considered to be a minor complication as surgical revision was not necessary. It was first observed 6 mo after surgery in 6 screws, without any sign of lameness. Three months later, 2 screws had become looser, but the dog remained asymptomatic. Revision was not considered necessary because of good limb function. A second plate was added craniolaterally to decrease stress concentration on the FPCUA. We covered 50% of the third metacarpal bone in this pancarpal arthrodesis (11); up to 80% of the metacarpal bone should be covered to minimize the risk of instability (6). En-bloc resection of the ulna and radius did not have a negative impact on construct stability in 1 study (4). The use of polymethyl methacrylate (PMMA) could have increased the strength of our autograft. In a study using intercalary bone grafts, implant failure was significantly associated with non-cemented allografts (13). The use of locking compression plates could also have improved construct stability.

A preoperative biopsy was not taken because the history, age, and breed, and radiographic findings were characteristic of a primary bone tumor and not typical of either metastatic neoplasia or fungal or bacterial osteomyelitis. Furthermore, the owner’s decision regarding surgery would not have been influenced by the knowledge of tumor type. Intraoperative or preoperative cytology could have been performed to confirm diagnosis before proceeding with limb-sparing surgery. Distal radial OSA rarely affects the distal ulna (1); however, the neoplastic pseudocapsule
frequemment adhère à la plaque. Nous avons fait le choix de ne pas utiliser les stabilisateurs ulnaires proximaux par précaution, car la longueur du radius était telle que cette technique ne permettait que des marges de 3 cm. Si la tumeur avait été plus longue, ce technique ne serait pas possible. Les marges de 40 % de résection de la longueur du radius pourraient menacer la fonction de l’articulation du coude.

En conclusion, une greffe corticale ulnaire proximale pourrait être efficace en chirurgie de sauvetage du radius distal, en fournissant une tumeur suffisamment petite pour le stabilisateur ulnaire proximal. L’amélioration de cette technique est requise avant qu’elle puisse être recommandée en routine.

Références


La RVC en ligne

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Case Report  Rapport de cas

Carpal intra-articular blastomycosis in a Labrador retriever

Katharine S. Woods, Maureen Barry, Danielle Richardson

Abstract — A 6-month-old male castrated Labrador retriever was presented for coughing and forelimb lameness. *Blastomyces dermatitidis* was identified in cytology of sputum and synovial fluid. Repeat arthrocentesis 7 months later revealed resolution of septic arthritis. Fungal septic arthritis should be considered for cases of monoarthritis and may respond to oral itraconazole treatment.


*Blastomyces dermatitidis* is a thermally dimorphic fungus endemic to parts of North America, Central America, and Africa that causes systemic infection in dogs and humans (1–4). *Blastomyces dermatitidis* forms conidia in the environment, which are inhaled by the host. If the host cannot clear the conidia via cell-mediated immunity, the conidia may transform into yeast at body temperature, reproduce asexually, and cause pulmonary disease (1,4). In yeast form, *B. dermatitidis* can disseminate throughout the body via hematogenous or lymphatic spread (4). Preferred sites of infection include lungs, skin, and eyes (1,4). Bony involvement has also been described in 14% to 60% of canine and human patients (1,2,4). However, while confirmed synovial involvement in blastomycosis has been reported in humans and, rarely, in dogs (5–9), treatment options for canine blastomycotic septic arthritis have not been reported in the veterinary literature.

Case description

A 6-month-old male castrated Labrador retriever was presented to the Ontario Veterinary College Health Sciences Centre (OVCHSC) for further evaluation of acute onset of coughing of 2-weeks duration. The dog was current on vaccinations and had received monthly heartworm prophylaxis. He also had a history of travel to Georgian Bay, Ontario. The dog had been clinically healthy at the time of castration 2 wk prior to presentation. Within 12 h of anesthesia, a non-productive cough was noted and oral antibiotics (amoxicillin-clavulanate, Clavamox; Pfizer Animal Health, Kirkland, Quebec), 12.5 mg/kg body weight (BW), PO, q12h, were prescribed. The cough persisted despite antibiotic therapy and the dog became progressively lethargic and anorexic. The dog was re-assessed by an emergency hospital 24 h prior to presentation to the OVCHSC for persistent cough, one episode of self-limiting epistaxis, one episode of vomiting, and acute right forelimb lameness. The lameness was localized to the right carpus. Thoracic radiographs performed at the emergency hospital identified a moderate, generalized, multifocal interstitial to nodular pattern. Right carpal and orthogonal radiographs of the left and right humeri were unremarkable, as assessed by a board-certified radiologist. The dog was referred for further diagnostic testing and supportive care.

Upon presentation to the OVCHSC, the dog was quiet, alert, and responsive. The dog was thin, with a body condition score of 2/5 and was assessed as 7% dehydrated. The dog was febrile [rectal temperature = 40.0°C, reference interval (RI): 37.5 to 39.0°C], tachycardic (heart rate = 180 beats/min, RI: 80 to 160 beats/min) and tachypneic (respiratory rate = 66 breaths/min, RI: 12 to 30 breaths/min), with pulmonary crackles auscultated bilaterally. The left prescapular lymph node was mildly enlarged and firm. Orthopedic examination identified pain upon palpation of the diaphysis of all appendicular long bones and upon manipulation of the right carpus. Oxygen saturation was decreased on room air (oxygen saturation = 88%, normal value: > 95%) and the dog coughed frequently and produced a firm, mucoid sputum. The remainder of the physical examination was unremarkable.

A complete blood (cell) count (CBC) identified a mild leukocytosis characterized by neutrophilia with a marked left shift.
Figure 1. Lateral (left) and dorsopalmar (right) radiographs of the right carpus, which identify increased soft tissue opacity confined to the carpal joint capsule. Bony structures are unremarkable.

(leukocyte count = 16.6 × 10^9/L, RI: 4.9 to 15.4 × 10^9/L; segmented neutrophil count = 12.12 × 10^9/L, RI: 2.9 to 10.6 × 10^9/L; band neutrophil count = 1.66 × 10^9/L, RI: 0.0 to 0.3 × 10^9/L). Moderate toxic changes were present on the blood smear. The biochemical profile was unremarkable. Cytology of the sputum identified mixed inflammation (75% markedly degenerative neutrophils and 25% macrophages) and frequent extracellular round to oval yeasts. The yeast measured 8 to 25 μm in diameter, with clear, non-staining walls and stippled to basophilic cytoplasm. Occasional broad-based budding of the yeast was noted. Sputum cytology was consistent with active blastomycosis infection.

Ophthalmic examination performed by a board-certified veterinary ophthalmologist was unremarkable, except for an incidental incipient cataract in the left eye.

Treatment for pulmonary blastomycosis and presumptive panosteitis, based on patient age and clinical signs, was initiated with intravenous fluid therapy, nasal oxygen supplementation via unilateral nasal cannula, itraconazole (Sporanox 100 mg capsules; Janssen, Toronto, Ontario), 5 mg/kg BW, PO, q24h; dexamethasone (2 mg/mL injection; Schering-Plough Canada, Kirkland, Quebec), 0.05 mg/kg BW, IV, q24h; sedation upon presentation [butorphanol tartrate (Torbügesic 10 mg/mL injection; Fort Dodge/Pfizer Animal Health, Kirkland, Quebec), 0.2 mg/kg BW, IV, PRN; analgesia (fentanyl citrate, 50 μg/mL injection USP, Sandoz Canada, Boucherville, Quebec), 2 to 6 μg/kg per hour, gabapentin (Neurontin 100 mg capsules; Pfizer Animal Health, Kirkland, Quebec), 10 mg/kg BW, PO, q12h, and gastroprotectants [omeprazole (Losec, 20 mg tablets; Proctor and Gamble, Toronto, Ontario), 1 mg/kg BW, PO, q24h; famotidine (Johnson & Johnson/Merck Consumer Pharmaceuticals, Guelph, Ontario)], 0.5 mg/kg BW, IV, q12h. Dexamethasone was administered at an anti-inflammatory dose in an attempt to avoid an exuberant pulmonary inflammatory response following institution of anti-fungal therapy. The dog was treated with antacids due to dexamethasone administration and the history of anorexia and single episode of vomiting. Famotidine was given concurrently with omeprazole for 3 d due to the lag time from administration of omeprazole to full clinical effects (10), following which famotidine therapy was discontinued. The dog remained febrile while in hospital, but his condition gradually improved, based on normalization of resting respiratory rate, and improved appetite and energy level. Oxygen supplementation was discontinued after 5 d in hospital, when the dog could maintain normal oxygen saturation on room air, and the dog was discharged 6 d after admission. Discharge instructions included exercise restriction and the following medications: itraconazole (5 mg/kg BW, PO, q24h), prednisone (0.5 mg/kg BW, PO, q24h), omeprazole (1 mg/kg BW, PO, q24h), gabapentin (10 mg/kg BW, PO, q8h), tramadol (2 mg/kg BW, PO, q8h, 50 mg capsules, compounded by the Ontario Veterinary College Pharmacy, Guelph, Ontario). Omeprazole and dexamethasone were discontinued soon after discharge, once the dog began eating normally at home.

The OVCHSC Emergency Service reassessed the dog 1 wk following discharge for recurrence of self-limiting epistaxis. Upon presentation, the dog was bright, alert, and responsive. A small 0.3 cm firm, freely mobile, alopecic mass was identified on the caudomedial aspect of the left elbow. The right carpus and long bones remained painful. In addition, the right carpus was moderately swollen secondary to joint effusion, which was a new physical examination finding since the initial presentation. Oxygen saturation was within normal limits. Complete blood cell count identified a mild neutrophilia (segmented neutrophil count = 14.36 × 10^9/L, RI: 2.9 to 10.6 × 10^9/L) with a left shift (band neutrophil count = 0.46 × 10^9/L, RI: 0.0 to 0.3 × 10^9/L), moderate monocytosis (2.00 × 10^9/L, RI: 0.0 to 1.1 × 10^9/L) and mild thrombocytosis (platelet count = 468 × 10^9/L, RI: 117 to 418 × 10^9/L). Coagulation profile (prothrombin time, PT; partial thromboplastin time, PTT) was assessed due to the recurrence of self-limiting epistaxis and was within normal limits. The dog's owners declined further diagnostic testing or hospitalization due to financial limitations and treatment was continued with itraconazole, tramadol, and gabapentin.

The dog was presented to the OVCHSC 3 wk following initial presentation for a scheduled recheck examination. The respiratory signs continued to improve; however, the dog remained moderately lame on the right forelimb. Physical examination identified harsh respiratory signs bilaterally and a moderately swollen right carpus. The diaphyseal bone pain had resolved.

Biochemical profile identified a mild elevation in blood urea nitrogen (9.6 mmol/L, RI: 3.5 to 9.0 mmol/L), but was otherwise unremarkable. Two view orthogonal thoracic radiographs identified a mild diffuse nodular interstitial pulmonary pattern and a moderately diffuse bronchial pulmonary pattern. Radiographs of the right carpus identified increased soft tissue opacity, confined to the joint capsule. The carpal bones did not appear to be affected by the swelling (Figure 1). The dog was sedated with butorphanol tartrate (Torbügesic; Fort Dodge/Pfizer Animal Health) 0.2 mg/kg BW, IV for arthrocentesis of
the right carpus. Cytology of the joint fluid identified increased cellularity (nucleated cell count > 70 × 10^6 cells/μL) characterized by 77% non-degenerate neutrophils and 23% mononuclear cells. Occasional fibroblasts and multinucleated giant cells were identified. Yeasts, measuring 10 to 15 μm in diameter with a refractile, deeply basophilic cell wall were scattered amongst the inflammatory cells. Cytology was consistent with blastomycotic septic arthritis and suppurative inflammation.

Treatment options including chronic oral anti-fungal therapy alone and oral anti-fungal therapy with surgical lavage of the carpal joint were discussed with the owners. They elected to continue with oral anti-fungal therapy alone, with instructions to continue itraconazole until resolution of pulmonary radiographic changes.

Seven months following initial presentation, the dog was clinically well. The right carpal swelling resolved 2 mo into therapy. Serial biochemical profiles have been within normal limits. Repeat thoracic radiographs identified improvement in pulmonary radiographic changes to a mild bronchiointerstitial pattern. Repeat arthrocentesis of the right carpus identified mild mononuclear inflammation. No yeast organisms or suppurative inflammation were identified. The cytology of the right carpal synovial fluid was consistent with degenerative joint disease, which may be a sequel to previous septic fungal arthritis. The dog is still being treated with oral itraconazole, which will be continued until the dog’s pulmonary radiographic changes are resolved or until they are stable, along with a negative urine blastomycosis antigen test.

**Discussion**

This case report describes systemic blastomycosis infection in a dog that was presented with septic monoarthritis. The blastomycotic septic monoarthritis was treated successfully with oral itraconazole. In addition to arthritis, the dog had evidence of pulmonary involvement, which is consistent with the pathogenesis of systemic blastomycosis (1,3–4). An enlarged prescapular lymph node was identified on initial physical examination, which may have also been related to systemic blastomycosis; however, as the lymph node was not aspirated this cannot be confirmed. *Blastomyces dermatitidis* can affect almost every organ and body system; however, fungal arthritis is considered a rare cause of canine lameness (1,11–12). While blastomycosis has been previously identified in canine synovial fluid (9), specific treatment recommendations for blastomycotic septic arthritis do not exist.

Joint and bone pain is a common presenting complaint in human patients with systemic blastomycosis (5). However, blastomycotic arthritis is infrequent, with fungal organisms identified within synovial fluid of only 3% to 8% of human patients (5–6). Arthritis may be the primary reason for presentation and the most common clinical signs include joint effusion, pain on manipulation, and decreased range of motion (7). Septic fungal arthritis in humans is typically monoarticular, with acute onset of severe pain (5,7–8). Knees, elbows, and ankles are most commonly affected, although small joints of the hands and feet may also be involved (7–8); most patients exhibit concurrent extra-articular signs of blastomycosis (5). Pathogenesis of fungal septic arthritis is suspected to be secondary to juxta-articular osteomyelitis or hemorrhagic spread, but predisposing osseous injury secondary to trauma has also been hypothesized (5–6). The diagnosis is best made via cytology of synovial fluid, which is a sensitive and specific diagnostic test (5).

The clinical features of the dog in this case report are similar to those described in humans. The dog experienced acute onset of carpal lameness, with pain identified on physical examination. Carpal effusion was identified at the first recheck examination and *B. dermatitidis* organisms were identified in synovial fluid. It should be noted that the pyogranulomatous inflammation expected secondary to blastomycosis tends to be mild in synovial fluid, compared with solid tissues, and yeast cells may become cremated in fluid cytology which can mimic the appearance of starch granules (e.g., talcum powder) (9). On orthopedic examination, generalized diaphyseal long bone pain was also identified. Due to the age of the patient, presence of long bone pain, and lack of radiographic changes, we initially began treatment for presumed panosteitis. As dexamethasone was being administered to prevent pulmonary inflammation, non-steroid anti-inflammatory drugs, which are the treatment of choice for panosteitis (13), could not be concurrently administered. Panosteitis is a common cause of lameness in medium to large breed dogs and can affect multiple limbs (13). Panosteitis is less likely in this case as serial forelimb radiographs did not identify changes consistent with the disease, such as medullary radiolucency, granular radiopacity in the region of the nutrient foramen, and formation of new endosteal bone (13–14). It is possible that the dog in our case had fungal osteomyelitis, but that his osseous lesions were too minimal to produce radiographic changes. A bone scan or computed tomography may be more sensitive than radiographs for identification of inflammatory bony lesions, such as fungal osteomyelitis (4,13); however, this was not pursued in this case due to financial limitations. In addition, fungal osteomyelitis is often noted at the epiphysis distal to the elbow and/or stifle and diaphyseal pain would be an atypical presentation (1,4). A second hypothesis is that the dog was experiencing generalized myalgia and arthralgia secondary to systemic blastomycosis infection, as is reported in the human literature (5,15).

There are no specific treatment guidelines for fungal septic arthritis in humans as these cases are often considered in conjunction with fungal osteomyelitis (15). A review of orthopedic blastomycosis (6) found that the majority of patients were treated with a combination of medical antifungal therapy (amphotericin B and/or other oral antifungal drugs) and surgical debridement. Few patients in that study experienced treatment failures; however, some patients were successfully treated with non-surgical therapy alone (6). Similarly, a case series of blastomycotic osteomyelitis found that medical antifungal therapy was often sufficient treatment (7). Another case series of orthopedic blastomycosis identified that treatment failures were associated with inadequate antifungal therapy, as opposed to type of antifungal therapy or surgical treatment (5). Therefore, surgical debridement of fungal osteomyelitis in humans is only recommended when medical management has failed (15).

While joint involvement of blastomycosis is frequently mentioned in the veterinary literature, case reports and specific
treatment guidelines for canine blastomycotic septic arthritis are rare. A review of cytologic findings in 43 dogs with naturally occurring blastomycosis identified *B. dermatitidis* organisms in synovial fluid of 3 dogs; however, therapies and treatment outcomes for these dogs were not discussed (9). There is a previous case report of isolated patellar blastomycosis in a dog, which resulted in arthritis and stifle lameness (16). Lytic lesions were identified in the left patella and histopathology of surgical synovium and bone biopsies identified Blastomyces organisms (16). However, no microorganisms were identified within the joint fluid itself (16). The dog responded to treatment with surgical debridement of the patella, a 90-day course of oral itraconazole, and physical therapy; however, successful treatment was based solely on clinical signs, physical examination findings, and patellar radiographs (16). Repeat cytology, histology, or fungal culture, which are the only ways to definitively diagnose blastomycosis (1), were not performed to confirm resolution of infection in this dog (16). Itraconazole is considered the treatment of choice for systemic canine blastomycosis, as long as there is no central nervous system involvement, with a 70% to 90% response rate reported (1,4,17). Both surgical and medical treatment options were considered for the dog in this case report. Due to financial limitations, the owners declined arthrotomy and lavage. The dog responded well to oral itraconazole and clinical signs associated with carpal septic arthritis resolved within 2 mo of therapy. Repeat arthrocentesis of the right carpus and cytology performed following 7 mo of itraconazole therapy was negative for *B. dermatitidis* organisms and suppurative inflammation. This case report represents the first documented resolution of blastomycotic arthritis with confirmation based upon repeated arthrocentesis. This finding is significant as it indicates that canine septic fungal arthritis secondary to generalized blastomycosis may resolve without surgical intervention, thus sparing a patient from unnecessary anesthesia and increased morbidity.

A case of monoarticular fungal septic arthritis with concomitant pulmonary infection in a dog is presented. While rare, blastomycotic septic arthritis should be considered as a differential diagnosis for bone and joint infection in patients which have travelled to endemic areas. This condition may respond to oral antifungal therapy alone. Clinical trials are needed to prospectively compare treatment outcomes of antifungal therapy alone to antifungal therapy in combination with surgical intervention in dogs with septic blastomycotic arthritis.

References

Case Report  Rapport de cas

Subclinical cecal impaction in a dog
Shannon Westgarth, Ameet Singh, Andrew R. Vince

Abstract — A 7-year-old, bichon frise dog was incidentally diagnosed with cecal impaction. Typhlectomy was performed as cecal rupture and resultant septic peritonitis appeared to be imminent. Histopathological evaluation did not identify an underlying cause for impaction and cecal dysmotility was suspected. Subclinical cecal impaction has not previously been reported in dogs.

Résumen — Impaction cæcale subclinique chez un chien. Un diagnostic fortuit d’impaction cæcale a été posé chez un chien Bichon frisé âgé de 7 ans. Une typhlectomie a été réalisée, car une rupture cæcale et une péritonite septique résultante semblaient imminentes. L’évaluation histopathologique n’a pas identifié une cause sous-jacente pour l’impaction et la dysmotilité était soupçonnée. L’impaction cæcale subclinique n’a pas été précédemment signalée chez les chiens.


A 7-year-old, castrated male bichon frise dog was presented to the family veterinarian for its annual physical examination. A firm, caudal abdominal mass was palpated. The dog did not have any clinical signs at the time of presentation. Abdominal radiographs revealed a mineralized mass in the right caudolateral abdomen.

Case description
Upon presentation to the Ontario Veterinary College Health Sciences Centre (OVCHSC), the patient was bright and alert, and vital parameters were normal. A firm, round mass was palpated in the caudal abdominal region. The results of the remainder of the physical examination were unremarkable. Abdominal radiographs were repeated, and the abdominal mass appeared to be of similar size when compared to the radiographs performed by the family veterinarian. A mineralized, heterogeneous oval-shaped mass approximately 10 × 7 cm was visualized in the right caudal abdomen (Figure 1). The mass was well-demarcated and confined by a thin, soft tissue wall. Three-view thoracic radiographs were taken and were normal. An abdominal ultrasound revealed the presence of a markedly dilated cecum that was filled with fecal material. Due to the marked dilation of the cecum and the risk of rupture and secondary septic peritonitis, an exploratory celiotomy and typhlectomy were recommended to the owner. In preparation for general anesthesia, a complete blood (cell) count (CBC), serum biochemical profile, and urinalysis were performed and found to be within normal limits.

The following day, the patient was premedicated with hydromorphone (Sandoz, Boucherville, Quebec), 0.05 mg/kg body weight (BW), and general anesthesia was induced with propofol (APP Pharmaceuticals, Schaumburg, Illinois, USA), 2 mg/kg BW, and midazolam (Sandoz), 0.2 mg/kg BW. An exploratory celiotomy was performed through a ventral midline abdominal incision. Abdominal exploration revealed a markedly enlarged (10 × 7 cm), thin-walled cecum (Figure 2), filled with formed fecal material. The remainder of the abdominal exploration did not reveal any other abnormal findings. A typhlectomy was performed using a thoracoabdominal stapling device.

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(Multifire Endo TA30; Covidien, Mansfield, Massachusetts, USA) that was applied across the base of the cecum. The resected cecum was fixed in 10% neutral buffered formalin for 24 h, and routinely processed for histologic examination. The abdominal cavity was lavaged with warm physiologic saline and the edges of the rectus abdominus fascia were infiltrated with bupivacaine (Hospira, Lake Forest, Illinois, USA). The abdominal incision was then closed in a routine fashion. The dog recovered without complication and analgesia was provided using intravenous fentanyl (Sandoz), 2 to 3 \( \mu \)g/kg BW per hour. The dog was discharged 24 h after surgery, eating and drinking normally, and showed no signs of abdominal discomfort. At last follow-up 4 mo after surgery, the patient was doing clinically well.

On light microscopic examination, all tissue layers of the cecum were present and intact but uniformly thinned (Figure 3). Within the tunica muscularis there was patchy fibrosis, with individual and clustered myofibers isolated from one another by fibrous connective tissue. Numerous morphologically normal submucosal and myenteric plexi were identified within all sections. There was no evidence of inflammatory, degenerative, or dysplastic changes within the nervous tissue compartment of the cecum wall.

**Discussion**

Diseases of the cecum, including inversion (1), neoplasia (2), and impaction (3–5) have been reported in dogs. There have been 3 previous reports of cecal impaction in the dog (3–5). The most common clinical signs associated with cecal impaction include: vomiting, diarrhea, anorexia, and feces containing blood or mucus (3–5). These signs have been reported as beginning over a period of several weeks (3), or intermittently over the course of several months (4,5). To the authors’ knowledge, this is the first report of cecal impaction in a dog that did not result in clinical signs. This may indicate that cecal impaction occurs more commonly than previously thought, but remains undiagnosed.

Similar to previous reports (3,4), histopathological evaluation of the cecum in this case failed to identify an underlying cause for impaction. The extensive fibrosis identified within the tunica muscularis was interpreted as being the result of ischemia secondary to increased luminal pressure, which would have resulted in collapse of the local venous circulation. The fact that there was no indication of ongoing necrosis in any tissue compartment indicates that such pressure spikes were intermittent, likely relieved by a combination of myodegeneration (resulting in relaxation and further dilation of the cecum) and possibly release of some cecal content via the cecocolic orifice. The degree of fibrosis present would have interfered with normal peristalsis, and likely contributed to the propagation of cecal dilation. It is likely that abnormal motility of the cecum was the predisposing factor; however, this is difficult to substantiate. In our case, the histological diagnosis of cecal smooth muscle atrophy and fibrosis is similar to that from a previous case report on cecal impaction by Eastwood et al (5), who suggested that these findings are comparable to those of visceral myopathies in humans.

Visceral myopathies are characterized histologically by degeneration and progressive replacement of intestinal smooth muscle cells with fibrosis that typically affects the longitudinal layers (6). Although this condition is generally diffuse throughout the entire intestine in humans, segmental forms do occur and may be similar to the isolated disease of the cecum in the case of this report (7). Biopsy and histopathological examination of the remaining portion of the gastrointestinal tract have been recommended in cases of cecal impaction to further characterize a suspected motility disorder (2). Full-thickness biopsies of the remaining portions of the GI tract may have been helpful in determining an underlying cause in the present case. Visceral
myopathies in humans are generally given a poor prognosis. Surgery is avoided in cases of diffuse disease, but can be effective in segmental forms of the disease (7). Caution must be exercised when attempting to compare visceral myopathies in humans with cases of cecal impaction in dogs as the smooth muscle atrophy and fibrosis could be secondary changes from impaction and not the underlying cause.

The cause of cecal impaction in the absence of any apparent predisposing factor is difficult to determine. Motility in the intestine is complex and is initiated by the interstitial cells of Cajal (ICC), which are the intestinal pacemaker cells and are a specialized population of smooth muscle cells that control intestinal motility (8). Intestinal cells of Cajal contain large numbers of mitochondria, endoplasmic reticulum, and have relatively few contractile elements compared with other smooth muscle cells (8). These cells are responsible for slow wave production which initiates spiking activity in the intestines, generating contractions (8). Isolated smooth muscle cells rarely generate spontaneous electrical activity (9), but an isolated ICC can and will allow for efficient and normal peristalsis (9,10). These pacemaker cells can direct motility orally or aborally, which results in retention during digestion, as well as transit aborally. If ICC are unable to normally coordinate oral and aboral transit of feces through the cecum, retention of feces may become pathologic leading to impaction.

Cecal impaction occurs in several species, and is well-recognized in horses (11). There are 2 distinct classifications of cecal impaction in horses; type I — which results from the cecum being packed with ingesta, or type II — a massively distended cecum as a result of a motility disorder (12). In horses, all efforts are made to try and preserve the cecum and typhlectomy is advocated when attempting to compare visceral myopathies in other species included in this report, cecal impaction and marked dilation did not result in clinical signs; however, elective typhlectomy was performed as cecal rupture and resultant septic peritonitis appeared to be imminent.

Acknowledgment
The authors acknowledge Dr. Leah Larsen from Westend Veterinary Hospital for help with case care and follow-up. (cv)

References
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Brief Communication

Candida osteomyelitis in a gelding

Aimie Doyle, Alfonso López, LeeAnn Pack, Anne Muckle

Abstract — A 2-year-old gelding was referred for evaluation of severe right forelimb lameness. The horse was grade 4/5 lame on the right forelimb. Clinical, laboratory, and radiographic findings were consistent with septic arthritis and osteomyelitis. Due to poor prognosis the owner elected euthanasia. Histopathology confirmed chronic arthritis and osteomyelitis with intrasional yeast (Candida species).

Résumé — Ostéomyélite à Candida chez un hongre. Un hongre âgé de 2 ans a été référé pour l'évaluation d'une boiterie grave du membre antérieur droit. Le cheval avait une boiterie de stade 4/5 du membre antérieur droit. Les constatations cliniques ainsi que les résultats de laboratoire et des radiographies étaient conformes à l’arthrite septique et à l’ostéomyélite. En raison d’un pronostic sombre, le propriétaire a choisi l’euthanasie. L’histopathologie a confirmé l’arthrite chronique et l’ostéomyélite avec des levures intralésionnelles (espèce Candida).

A 2-year-old Standardbred gelding was referred to the Atlantic Veterinary College, Veterinary Teaching Hospital (AVC-VTH) for evaluation of a severe right forelimb (RF) lameness of 2-weeks duration. It was suspected, although not confirmed, that the horse had been treated prior to his last race with an intra-articular injection of corticosteroid. The horse had raced 3 wk prior to evaluation and was then turned out to pasture. He had been found in the pasture with non-weight bearing lameness on the RF 2 wk prior to presentation at the AVC-VTH. The referring veterinarian examined the horse at that time and discovered a non-weight bearing RF lameness with severe soft tissue swelling and pain after flexion. Radiographs of the RF metacarpophalangeal (MCP) joint were obtained for suspected fracture but were within normal limits.

The referring veterinarian placed the horse on penicillin G procaine (PenPro; Vétoquinol, Lavaltrie, Quebec) 22 000 IU/kg body weight (BW), IM, q12h, phenylbutazone (Vétoquinol), 4.4 mg/kg BW, IV q24h, and strict stall rest then re-examined the horse 1 wk later. At this time there was no improvement in clinical signs and radiographs were repeated. Mild osteolysis of the proximal sesamoid bones was found and was assumed to be a result of limb disuse. No other abnormal findings were noted. Arthrocentesis of the RF MCP joint was also performed at this time and joint fluid was submitted for cytology. Cytology revealed a mild increase in nucleated cell count (5.1 × 10^9/L; normal value < 5.0 × 10^9/L) but a marked increase in total protein (70 g/L; reference range: 8 to 25 g/L). Phenylbutazone was continued at the previous dose but the antibiotic was switched to oxytetracycline (Oxymycine LP; Wyeth Animal Health, Guelph, Ontario), 7.5 mg/kg BW, IV, q24h. No improvement in clinical signs was seen over the next week and the horse was referred to the AVC-VTH.

Upon presentation, the horse was grade 4/5 lame on the RF with severe soft tissue swelling of the distal limb and palpable heat in the palmar aspect of the fetlock area. Forced flexion of the MCP joint induced a severe pain response. Radiographs of the MCP joint were obtained and revealed severe soft tissue enlargement with small radiolucent areas in a mottled pattern within the proximal sesamoid bones. These changes were consistent with osteomyelitis (Figure 1). Ultrasound examination of the MCP joint revealed thickening of the synovium within the joint, and marked periarticular edema but no significant joint effusion. Following imaging, a high suspicion of joint sepsis and concurrent osteomyelitis of the proximal sesamoid bones prompted arthrocentesis and cytologic examination of the joint fluid of the RF MCP joint. Cytology revealed moderate to marked neutrophilic inflammation with a total nucleated cell count of 17.2 × 10^9/L and a total protein of 69 g/L, consistent with severe joint inflammation. No etiologic agent of joint sepsis could be identified on cytology. A poor prognosis for return to racing was given to the owner; the horse was euthanized and a postmortem examination was done.

Significant postmortem lesions were restricted to the right MCP joint that appeared notably swollen due to subcutaneous edema and peri-articular fibrosis. There was no evidence of synovial effusion but the synovial membrane was notably swollen and edematous with fibrin on the surface (Figure 2). This...
synovial swelling extended 7 cm proximally and 3 cm distally from the MCP joint articulation. The articular cartilage was grossly normal except for a small area (1 to 2 mm) in which the cartilage was moderately pitted. Longitudinal sections of affected bones did not reveal any gross evidence of inflammation or osteoporosis. Three swabs were taken from 2 areas of the right MCP joint for microbiologic culture. Pieces of the MCP bones and both of the proximal sesamoid bones were placed in decalcifying solution, and pieces of synovial membrane, articular capsule, and periarticular tissues were fixed in formalin for processing and microscopic examination.

Microscopically, the synovial membrane was diffusely thickened and markedly hypercellular with large numbers of infiltrating plasma cells, lymphocytes, and fibroblasts and to a lesser extent macrophages and neutrophils (Figure 3). The surface of the synovial membrane was covered by organized fibrin admixed with some neutrophils, macrophages, and cellular debris. The cytoplasm of some macrophages contained karyorrhectic debris. In addition to inflammatory cells, the fibrous portion of the synovial membrane was infiltrated by fibroblasts and showed abundant neovascularization. These proliferative changes extended deep into the surrounding articular capsule and tendon sheaths. A few small fragments of trabecular bone appeared impacted into the adjacent capsular fibrous tissue. The articular capsule had angiocentric infiltration of mononuclear cells and small foci of interstitial hemorrhage. Surprisingly, there was no evidence of synovial villous hypertrophy or hyperplasia.

Sections of right proximal sesamoid bones revealed remarkable microscopic changes characterized by cartilage fibrillation and subchondral microabscesses. These microabscesses consisted of large aggregates of neutrophils surrounded by a thick rim of macrophages, fibroblasts, and lymphocytes. At the junction of the bone and cartilage there were large colonies of yeasts which were microscopically visible by routine hematoxylin and eosin (H&E) staining (Figure 3). These organisms were round to oval, Periodic acid-Schiff (PAS) and Gomori’s methenamine silver (GMS) positive, measuring 3 to 7 μm in diameter. The swabs taken from the affected joint yielded scant growth of Escherichia coli and yeast. The yeast was identified by Matrix Assisted Laser Desorption Ionization Time of Flight mass spectrometry (MALDI-TOF) (microflex™ LT; Bruker Daltonics, Bruker Corporation, Milton, Ontario) as Candida glabrata with a 2.3 organism best match score value.

Candida species are ubiquitous commensal yeasts normally present in skin and mucous flora that, under suitable conditions, can become invasive and cause disease called candidiasis in humans and animals (1). Candidiasis affects particularly the skin and mucosal membranes, while invasive infections affecting internal organs are rare. Osseous and articular candidiasis is reported sporadically in humans with risk factors such as immunosuppression or concurrent debilitating disease; it can also be secondary to administration of broad-spectrum antibiotics (2). The prognosis for osseous candidiasis is good once the condition is diagnosed and appropriately treated with antifungals, with or without surgery. A large study in human patients with osseous candidiasis revealed predilection for vertebrae and sternum, but other bones such as limbs, fingers, and mandible can also be affected (3).

As in humans, infections with Candida species in animals are most frequently superficial and invasive, such as osseous...

**Figure 1.** Lateral radiograph of the right metacarpophalangeal joint demonstrating the mottled radiolucent areas in the proximal sesamoid bones (arrows). Significant soft tissue enlargement is noted.

**Figure 2.** Right metacarpophalangeal joint. Note extensive edematous swelling of the synovial membrane (asterisk) and a plaque of fibrin on the synovial surface (arrow).
Candidiasis, and are only sporadically reported (4). Candida osteomyelitis is a rare but well-documented disease in horses (5). The port of entry to the bone by the yeast is often difficult to establish but, based on the clinical history, many authors propose that it is by wound contamination, traumatic implantation, or arthroscopy (4–5). The port of entry for the Candida for the horse described in this report was not identified as there was no confirmed history of trauma or intra-articular injection, although the latter was suspected. It is also known that Candida species can invade bones or joints by the blood circulation (candidemia), but this hemogenous form of dissemination typically occurs in immunocompromised patients (6). This route of infection, however, was unlikely herein since there were no risk factors such as immunosuppression in this horse. It could be speculated that genetics could have played a role in the susceptibility to invasive yeast osteomyelitis since experimental murine models have shown phenotypic predisposition to candidiasis (7). Broad-spectrum antibiotics administration has been associated with the development of osseous and articular candidiasis in humans and may have contributed to the development of disease in our case (2).

Clinical diagnosis of systemic candidiasis such as yeast osteomyelitis is challenging as it requires invasive techniques such as bone biopsy or yeast culture which are time consuming. Recently, DNA-based tests such as PCR have been proposed for rapid detection of invasive candidiasis (8). Candida species arthritis has been successfully treated with systemic amphotericin B administration and joint lavage in the horse (9). Aspergillus species osteomyelitis of the axial border of the proximal sesamoid bones was also successfully treated with regional limb perfusion, joint lavage, and long-term, systemic itraconazole administration in a horse (10). That horse remained lame following resolution of infection due to the sequelae of osteoarthritis of the MCP joint. In our case, the invasiveness of the osteomyelitis of the proximal sesamoid bones and severe inflammation of the MCP joint provided a poor prognosis for return to racing with or without treatment, and the owner elected euthanasia. However, these previous reports, and reports in humans, suggest fungal osteomyelitis and arthritis can be resolved with appropriate treatment, but prognosis for athletic soundness should remain poor. Although clinical diagnosis of fungal osteomyelitis is difficult, histopathological diagnosis is simple because yeast can be easily identified microscopically.

This report presents a case of Candida species osteomyelitis of the proximal sesamoid bones following suspected intraarticular injection. Systemic fungal infections in the horse are rare but should be considered as a differential diagnosis for horses with joint sepsis and/or osteomyelitis.

References

Renal adenoma in a 5-year-old Labrador retriever: Big is not always bad

Kristina Lillakas

Abstract — A 5-year-old Labrador retriever was presented with anorexia, hematuria, and a 3-week history of mild lethargy, periodic inappetance, and weight loss. A firm mass in the cranial abdomen was discovered on physical examination. Following clinical work-up the owners elected euthanasia. On postmortem examination, histopathology determined that the mass was a benign renal adenoma.

A 5-year-old, neutered male, Labrador retriever dog was presented to Mill Bay Veterinary Hospital with a 3-week history of mild lethargy, periodic inappetance, and an increase in “lip smacking.” Within this 3-week period the dog had also lost approximately 13% of its body weight.

Case description

There were no abnormal findings on physical examination. Complete blood (cell) count and biochemistry (IDEXX Laboratories, Delta, British Columbia) were normal except for mildly elevated chloride and amylase levels. Subsequently, a serum Spec cPL (canine pancreas-specific lipase) and Cryptococcus titer (by latex agglutination) (IDEXX Laboratories) were determined and the results of both were within normal limits.

Four days after initial presentation, the dog was re-admitted due to anorexia and hematuria of 24-hour duration. On physical examination, a firm mass was palpated in the ventral abdomen immediately caudal to the last rib; palpation of the mass appeared to elicit pain. A catheterized urine sample (in-house urinalysis) showed significant protein (3+ dipstick reaction; 5 g/L) and red blood cells (4+ dipstick reaction; ca. 250 erythrocytes/µL; under the microscope too numerous to count), many uniform transitional epithelial cells, and moderate numbers of white blood cells (2–3/high power field). In-house urine culture was negative for bacterial growth after 48 h. Single right lateral and ventro-dorsal radiographs of the thorax yielded no significant findings. On the single right lateral radiograph of the abdomen, a mass was visualized immediately caudal to the last rib and dorsal to the spleen. There appeared to be a mass effect on the single ventro-dorsal view of the abdomen, on the left side, just caudal to the last rib. An abdominal ultrasound revealed a poorly defined, 9.4 × 7.4 cm, left-sided cranial abdominal vascular retroperitoneal mass with left kidney invasion, no evidence of gross metastasis or great vessel invasion and an unremarkable aorta and vena cava (Radiology Vet Consulting, Trenton, Ontario). The main differentials at this point included renal adenocarcinoma, transitional cell carcinoma, and retroperitoneal hemangiosarcoma. A referral for advanced imaging with computed tomography (CT) or magnetic resonance imaging (MRI) was recommended, but due to the cost and clinical findings suggesting a poor prognosis, the owners opted to have the dog euthanized.

A postmortem examination revealed a 10.0 × 9.0 cm mass primarily affecting the cortical tissue of the cranial pole, as well as the renal pelvis, of the left kidney. The mass affected approximately 30% of the overall parenchyma (Figure 1). There was extensive hemorrhage within the retroperitoneal space surrounding the mass and extending from the left to the right side and over the caudal pole of the right kidney. The right kidney appeared grossly normal as did the other abdominal organs, lungs, and great vessels.

The entire left kidney and associated mass as well as samples from the right kidney, urinary bladder, right and left ureters,
urethra, lung, spleen, and liver were submitted for histopathology (Histovet Surgical Pathology, Guelph, Ontario). Multiple sections from the enlarged left kidney revealed the following histopathologic findings: an abrupt transition from normal kidney into a diffuse collection of coalescing tubules lined by orderly cuboidal epithelial cells showing minimal nuclear variation, no gigantism, no multinucleation, and virtually no mitotic figures. These cells were separated from the surrounding kidney by a very thin capsule of fibrous tissue. None of the sections taken from the junction between the tumor and the surrounding kidney displayed any significant invasive growth. In some areas there was significant tumor necrosis resulting in hemorrhage and fibrin deposition, which could explain the hematuria noted clinically. Sections of the left kidney taken at least 1 cm from the gross mass showed histologically normal renal architecture. The histopathological diagnosis of the sections taken from the left kidney and associated mass was as follows: a large but very well-differentiated renal papillary and tubular adenoma with a purely expansile growth habit. All other organs sampled were histologically normal.

**Discussion**

Primary renal tumors are an uncommon diagnosis in dogs (1–3). Over half of the primary renal tumors are epithelial in origin and most have been found to be malignant (1–4). Classification of malignancy is most often based on light microscopy, or gross size, but the distinction between benign and malignant is some-

**Figure 1.** Top: left kidney and mass *in-situ*. Bottom left, clockwise: left kidney with mass and left adrenal, normal urinary bladder/ureters, normal right adrenal, normal right kidney; Bottom right, left kidney and mass on cut section, normal right kidney on cut section.
Acknowledgments

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References

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Vetmedin® gives them the strength of heart they need.
Do you see yourself and your practice as service- or product-oriented?” Dr. McCulloch asks her colleague, Dr. Ostrowski, as they tour the exhibition hall at a veterinary meeting. The question catches Dr. Ostrowski by surprise because he had never given the subject any thought. He maintains such a clear view of his practice goals that he never considered that others might not share these. Dr. McCulloch also maintains a clear view of her orientation that she, too, considers the most valid one. But what causes her to raise the question now is her growing suspicion that she and her colleague do not maintain the same orientation. Normally such a question would fall into the category of those raised to generate an interesting philosophical discussion between friends. However because she and Dr. Ostrowski are contemplating covering each other's practices during vacations and other periods of absence, she raises the issue for a very practical reason: she recognizes how their respective orientations could affect their communication with each other, staff members, and clients.

"Initially I was going to say that I see myself and my practice as more service-oriented," Dr. Ostrowski replies after giving his colleague's question some careful thought. "But that's not exactly true because I've spent a lot of time learning about marketing, sales, advertising, and other business tools to enhance my practice." 

"And," the veterinarian adds following more reflection, "I'm the first to admit that I'm profit-motivated. Not that I don't care about my clients and their animals. You know I do. But I have a family to feed and bills to pay and those are my top priorities. If I can convince my clients to invest more in their animal's well-being, I see that as helping them as well as me. What about you?"

"I'm more service-oriented," replies Dr. McCulloch. "Maybe it's a gender or age thing." Even though it would be convenient to dismiss this fundamental difference in practice philosophies so simplistically, such is not the case. Just as male and female practitioners of all ages may be more attracted to working with animals than the veterinary science and technology associated with it and vice versa, they may be more attracted to a service versus product or sales orientation too. The issue is not a matter of which orientation is right, but rather that practitioners acknowledge their orientation and how it may affect how they communicate with others.

For example, clients entering Dr. Ostrowski's clinic immediately will encounter displays of therapeutic diets, training and other aids, posters that educate but also tout the merits of certain drugs or vaccines, and a collection of brochures that do likewise in addition to those that promote the specific services offered by the clinic. Examination rooms offer a similar assortment of posters and visual aids, most bearing the logo of some veterinary company.

Compare that to what Dr. McCulloch's clients encounter. A collection of animal prints chosen to please and relax her clients adorn the waiting area and examination room walls. The closest she comes to any kind of marketing is a selection of generic brochures describing common animal problems, all neatly contained in a discrete display assembly. Whereas Dr. Ostrowski's waiting and examination rooms prime clients to ask about additional products and services, Dr. McCulloch's communicates that she will be recommending those which best meet her clients' and their animals' needs.

Because both clinicians can claim a loyal client base, it is safe to say that there are sufficient people who prefer one orientation over the other. But what happens when practitioners with such different orientations must communicate effectively with each other's clients?

For the sake of discussion, suppose that the two veterinarians do not explore this aspect of their practice philosophies before they begin covering for each other. The first day Dr. Ostrowski treats a 10-year-old stray cat brought in by one of the vacationing Dr. McCulloch's clients, Ms. Goff, for an ear infection. Dr. Ostrowski identifies the problem as a mite infestation. In addition to cleaning and medicating the animal's ears, he automatically draws blood for a geriatric panel and vaccinates the cat.

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cat. He also requests a stool sample and dispenses several cans and a bag of a premium diet along with the ear medication. So smoothly does he do this that the realization of how much she has just spent on a stray animal she cannot keep does not dawn on Ms. Goff until she is driving home. When it does, she is not pleased.

“Don’t get me wrong,” she tells a friend over lunch. “Dr. Ostrowski is a good vet, but everything about him and his practice comes on so strongly that I felt like I was being subjected to a sales pitch of some sort from the minute I walked in the door.”

“I agree that he’s a good vet, but I also like his approach,” replies her friend. “I took my dog to Dr. McCulloch’s once and to tell the truth, I found it pretty boring. She’s also a good vet, but I felt more like a spectator than actively engaged like I am at Dr. Ostrowski’s. Aside from that, after I got home I remembered that I meant to get Tinker some shampoo and that special food he likes so much. Dr. Ostrowski or his staff always reminds me about things like that, but Dr. McCulloch didn’t. Plus there was nothing in the waiting or examination rooms to suggest she even carried those products.”

“Well, yes, I can understand that,” admits Ms. Goff. “But I really had no intention of spending that much on an animal that isn’t even mine. It all seemed to happen so fast…”

“That’s your problem, not Dr. Ostrowski’s or his staff’s,” the friend counters. “When he says he’s going to run some test or add some product to the line-up, I ask him what it will cost me and if it’s worth it. If I can’t afford it or don’t think it’s worth it, I tell him so and he’s never given me any grief about it.”

This exchange points out the advantages and pitfalls for clients visiting each kind of practice. Not surprisingly, more aggressive clients prefer the more aggressive Dr. Ostrowski’s approach whereas less assertive ones find Dr. McCulloch’s approach more user-friendly. The key point to remember is that the fact that these practitioner and client orientations are so different in no way makes either one of them wrong. Unless practitioners with different orientations accept this, the probability of them working together harmoniously and not alienating clients of the opposite orientation is low.

Fortunately, the reason their respective orientations work so well for these veterinarians is because each of them possesses quality communication skills within that realm as evidenced by their devoted following. Consequently, it is not a case of sacrificing their own orientations but rather expanding those communication skills in a manner that encompasses and respects the other orientation without compromising their own.

In such situations, a combination of honesty and humor can do much to ensure quality communication. For example, when Dr. Ostrowski sees one of Dr. McCulloch’s clients he introduces himself and adds with a grin, “You may notice I come on a little stronger than Dr. McCulloch because I admit I love the wide range of products and services out there. But if I do, don’t hesitate to tell me to back off. She does it all the time.”

Meanwhile Dr. McCulloch informs Dr. Ostrowski’s clients with an equally big smile that she knows she is not nearly as fascinated by new products and services as he is, but she does share his desire to give their animals the best possible care. Because of that, she counts on them to ask about any products and services that interest them if she does not bring these up herself.

Similarly, when the practitioners cover for each other, they remind their respective staffs that an approach that works for their own clients may not work for the other veterinarian’s. Because both practices have savvy office managers who are familiar with both practitioners’ styles, it is a simple matter for Dr. Ostrowski’s staff to ask Dr. McCulloch’s clients if they are comfortable with all of his add-ons and graciously remove any the clients find troublesome. By the same token, Dr. McCulloch’s staff asks Dr. Ostrowski’s clients if there was any food, shampoo, or other product that Dr. McCulloch didn’t mention that they would like to pick up while they were at the clinic. In such a way the practitioners and their staffs acknowledge that differences in their practice orientations do exist. And they do this in a way that communicates their respect for these differing views.

Older practitioners may recall a time when merchandizing of any kind was viewed as unprofessional. But times have changed and today both orientations are necessary to address the needs of a client base whose needs have changed, too.
Stop brachycephalism, now!

Dr. Fraser Hale

What follows is an “opinion piece.” It is not based on any meta-analysis of large epidemiological databases or a literature review. It is based on the opinions I have developed in my 28 years in veterinary medicine, 21 of them spent doing nothing but dental and oral surgery on pet dogs and cats. Also, this piece has not been peer-reviewed, so any venom it invokes should be directed at the author alone. I hold The CVJ and its entire staff blameless in any controversy that might arise from the publication of these thoughts and observations.

Domestication of the dog and cat has been a double-edged sword. By agreeing to come into our homes and lives, they receive food, shelter, and companionship as well as medical care when indicated. However, they have also given up the right to choose with whom they reproduce and the chlorinating effect that Mother Nature has on the gene pool. As a result, there are many breeds of dogs and cats that are so hideously deformed and unethical that they would not last a week in the wild. I suspect that representatives from each of the specialty colleges could write a similar paper on the problems they see day in and day out that are a direct result of misguided breeding practices. As a veterinary dentist, I see the results of this in the ways it negatively impacts the oral health of these animals, and that will be my focus.

Some breeds are predisposed to certain serious conditions (dobermans and cardiomyopathy, wheatons and amyloidosis, westies and atopy...) but these animals are not intentionally bred to have these conditions. That would be crazy, inhumane, and unethical. So why is it that we condone, even promote, the breeding of animals whose very design has a negative impact on health and quality of life for every single member of the breed? I am referring to brachycephalism.

Before considering the problems that human-directed selective breeding has caused, we need to consider how the oral cavities of the various canine and feline species are supposed to be put together. An easy way to do this is to visit the Mammal Gallery of any natural history museum and observe the craniofacial architecture that is found in the wild (designs that work/reproduce without our help).

In the Canidae, the skull type is mesocephalic with a “scissors’ bite. The only place in the mouth that there is tooth-to-tooth contact is between the distal third of the lower first molar and the lower second and third molars contacting the two upper molars. Nowhere in the mouth is there any tooth-to-soft tissue contact. The teeth are proportioned such that they can line up in proper alignment with sufficient gingiva and alveolar bone to offer good periodontal support. In the Felidae, there may be a level bite with the incisors contacting but often there is no tooth-to-tooth or tooth-to-soft tissue contact at all in these obligate carnivores. Again, the size of the teeth is in proportion to the skeletal frame that they reside in so that alignment is ideal and there is good periodontal support for each tooth.

In contrast to this functional and desirable design, consider the brachycephalic skull type as seen in so many dog breeds and some cat breeds. Here the maxilla is too short compared to the mandibles. The upper incisors are in traumatic contact with the floor of the mouth and lower canine teeth. The maxillary premolars are so crowded that there may be no gingiva between and little or no bone support and the teeth may be rotated 90° or more. Some teeth may be under-erupted due to crowding and impaction against adjacent or opposing teeth. The result is that the animal effectively bites itself every time it closes its mouth and there is an extreme predisposition to early onset and rapid progression of periodontal disease. The traumatic contact between the maxillary incisors and the mandibular structures will often lead to traumatic pulpitis and pulp necrosis in the maxillary incisors. There is also often severe bunching-up of the palatal rugae with entrapment of hair, food, and bacteria leading to chronic, painful palatitis hidden from view at the bottom of the deep, closed folds.

Some of the dental/oral liabilities associated with brachycephalism can be mitigated by proactive surgery (selective extraction), but many animals do not get to benefit from these procedures and so live with chronic dental pain and infection.

In many Canadian jurisdictions, veterinarians have advocated for and achieved a ban on tail-docking, ear-cropping, and dewclaw removal as these are considered unnecessary cosmetic procedures that cause (temporary) pain with no benefit to the animals. I believe that as protectors of animal welfare, veterinarians should start a public awareness campaign to inform people of the serious, life-long negative impacts of brachycephalism. I believe we must stop referring to these conditions as “normal for the breed” and refer to them as “grossly abnormal in accordance with breed standards” because there is nothing remotely normal or desirable from the animal’s perspective. I believe we must stop using photographs of these deformed but comical.
breeds in advertising and promotional materials as this just increases public demand because they are “so cute.”

I am sure these words are going to stimulate some lively, possibly acrimonious response. I am effectively saying that it is unethical to purposely reproduce animals that are specifically designed to have serious structural deformities. The extension of this thinking would be to ban a great number of breeds. Oh, the backlash! My word! But when one looks at it strictly from the animal’s perspective, there is no valid, logical justification for brachycephalism. Its only positive is that many people find brachycephalic breeds esthetically pleasing (cute) and that is not a valid excuse for wilful perpetuation of these mutations.

I wish I could say it was just the brachycephalic breeds that have these issues. Sadly, such is not the case. Highly miniaturized breeds are inclined to have teeth that are proportionally far too large for their mouths, leading to many of the same crowding, under-eruption, non-eruption, and occlusal concerns seen in brachycephalic dogs of all sizes. But one battle at a time.

Suggested reading:
From the Old CUSP Articles available from http://www.toothvet.ca/Old%20CUSP%20Articles.htm
Last accessed December 5, 2012.

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