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AHL Newsletter

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In this issue:

Humane transport of live animals for necropsy

Maria Spinato

The AHL encourages submission of live animals for immediate euthanasia and necropsy, to ensure a high rate of diagnostic accuracy in poultry cases, and in outbreaks of diarrhea in young pigs and ruminants <50 kg. **We remind submitters that live animals must be transported humanely.** As of March 1, 2009, the Provincial Animal Welfare (PAW) Act requires that veterinarians report all suspected cases of animal abuse to the OSPCA. AHL veterinarians will confer with OSPCA inspectors to determine if an investigation is warranted in suspected cases of inhumane transport.

Examples of **inappropriate** restraint and transportation methods include:

- hog-tying calves, adult sheep or goats;
- baby pigs or chickens placed in sealed plastic tubs or styrofoam containers;
- pigs or chickens submitted in tied feed sacks.

Examples of **acceptable** transport containers include:

- dog or cat kennels for small pigs;
- cardboard boxes of appropriate size with ventilation holes for baby pigs or chickens;
- poultry crates;
- large dog kennels or bedded truck cabs for larger pigs, calves, small ruminants.

All containers should be of sufficient size to avoid crowding or smothering, and **animals should be protected from extreme temperatures**, from both within and outside the container.

Animals that cannot be transported humanely should be euthanized on-farm, and the practitioner is encouraged to collect appropriate samples for diagnostic testing. Please contact the AHL and request a consultation with a pathologist if assistance is required for sample selection. *AHL*

Investigation of the role of *Chlamydophila* spp and *Coxiella burnetii* in caprine and ovine abortions

Hugh Cai, Murray Hazlett, Josepha DeLay, Beverly McEwen, Durda Slavic

The AHL has, through the Animal Health Strategic Investment project, started investigations of the role of *Cp. abortus* and *C. burnetii* in small ruminant abortions in Ontario, and to determine if abortion is related to pathogen load using quantitative real-time PCR. Immunohistochemistry for both of these agents will also be performed for validation purposes (Figure 1).

During the period of this study, expected to last until May 2010, necropsies on aborted lambs and goat kids will be paid for with study funding, and **there will be no charge to the owner or veterinarian provided the placenta is submitted, either with the fetus (preferable) or alone**. Fetuses submitted without placenta will incur normal charges as listed in the AHL Fee Schedule. *AHL*

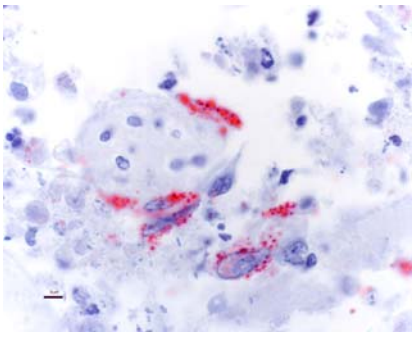

Fig 1. Immunohistochemistry of caprine placenta. *Chlamydophila abortus* organisms stain bright red. Bar = 5 µm.

Enhancing passive surveillance of influenza in swine

Jim Fairles, Bruce McNab, Davor Ojkic

Given the current interest in influenza, the Animal Health Laboratory and the Ontario Ministry of Agriculture, Food and Rural Affairs would like to enhance the quality and quantity of passive surveillance for influenza viruses in swine as part of the Ontario Animal Health Surveillance Network. To that end, effective immediately and until further notice over the next few weeks, **the AHL will waive the laboratory fees charged to veterinarians for PCR testing, virus isolation and strain typing for influenza viruses on swine respiratory cases where influenza is a diagnostic rule-out**. Submitting veterinarians will be responsible for all other laboratory fees associated with such cases.

Contact the AHL if you are unsure of what samples to submit in a particular case. Samples of choice are nasal swabs from clinically ill, pyrexic pigs, with respiratory signs and nasal discharge. **10 such pigs** should be sampled in each barn that has ill pigs, **in 2 sets of 5 pigs per pooled sample**, using nasal swabs in standard viral transport medium.

Veterinarians may note that, as of May 7, 2009, influenza in swine, including the novel Mexican 2009 H1N1, is not a federally reportable disease. Further investigation did occur by federal animal health and public health authorities when this new type of virus was discovered in Alberta. *AHL*

May 1, 2009 AHL User's Guide and Fee Schedule

- The AHL User's Guide and Fee Schedule May 1, 2009 has been updated and mailed to all of our clients via Canada Post.
- For Vet-clients only - it has been posted on our website at http://ahl.uoguelph.ca under the Veterinary Menu - click on Client login and enter your username and password. Here you will see both the Food Animal and Companion/Other Animal fee schedules.
- If you do not have access to our Vet-client portion of the website, please contact the AHL to set up your online account:
  - email info@ahl.uoguelph.ca or call 519 824 4120 x54320.
- If you require an additional hard copy of the guide, please contact holiver@lsd.uoguelph.ca

PLEASE NOTE - Antimicrobial susceptibility pricing is $4.50 per isolate for companion/other animals, and $2.50 for food animals. Susceptibility is **not included** in the price for Bacterial culture, abortion case (bcabo) and Bacterial culture, abortion case with *Campylobacter* culture (bcabc) vs "not available". *AHL*

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Its mission is to inform AHL clients and partners about AHL current activities, and laboratory-based animal disease events and disease trends.

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Our continued thanks to all of the non-author AHL clerical, technical, and professional staff who contribute to the generation of results reported in the AHL Newsletter.

Animal Health Strategic Investment up and running

Jane Gaviller-Fortune, Grant Maxie

Significant progress has been made recently in the Animal Health Strategic Investment (**AHSI**) project funded by OMAFRA as part of the 2008 Ontario Budget. A call for research proposals went out in February 2009, and 12 new research proposals were awarded funding in April 2009. A project already in progress (09-13, below) had earlier been awarded funding under AHSI.

The AHSI project was developed to support research in three areas: 1) developing tests for emerging pathogens, 2) enhancing animal health surveillance, and 3) improving emergency and business-continuity planning. The approved research proposals are summarized in the table below. As well as AHSI funding, many of the projects had matching or in-kind contributions.

Proj. ID	Project lead Project team members	Project title	Project term
09-01	Dr. Timothy Blackwell, OMAFRA Mr. Franklin Kains, Ms. Kathy Zurbrigg	Disease surveillance in a selected group of hog producers with minimal exposure to veterinary diagnostic services	2 yr
09-02	Dr. Andrew Peregrine, OVC Dr. Jocelyn Jansen, Dr. Andria Jones, Dr. Jane Learmount, Dr. Ralph Martin, Dr. Paula Menzies, Dr. Mike Taylor, Dr. John VanLeeuwen	Determination of the prevalence of anthelmintic resistance in Ontario sheep flocks with indicators of gastrointestinal parasitism	3 yr
09-03	Dr. Michele Guerin, OVC Dr. Davor Ojkic, Dr. Durda Slavic	Enhanced surveillance for viral and bacterial pathogens in commercial broiler chicken flocks in Ontario	3 yr
09-04	Dr. Claire Jardine, OVC Dr. Ian Barker, Dr. Patrick Boerlin, Dr. Bob Friendship, Dr. Scott McEwen, Dr. Davor Ojkic, Dr. Jane Parmley, Dr. Richard Reid-Smith, Dr. Jan Sargeant	Surveillance of disease agents of public health and agricultural significance in wildlife living on farms in Ontario	2 yr
09-05	Dr. John Prescott, OVC Dr. Valeria Parreira, Dr. Durda Slavic, Dr. Glenn Songer	Development and assessment of a diagnostic ELISA for *Clostridium perfringens* Cpb2 toxin, with special reference to swine and cattle	2 yr
09-06	Dr. Paula Menzies, OVC Dr. Jocelyn Jansen, Dr. Andria Jones, Dr. Andrew Peregrine	A survey of risk factors associated with condemnation of sheep carcasses due to *Cysticercus ovis* infection	2 yr
09-07	Dr. David Kelton, OVC Dr. Karen Hand, Dr. Davor Ojkic, Mr. George MacNaughton, Dr. Beverly McEwen, Mr. Dave McKeen, Mr. Neil Petreny, Mr. Ian Rumbles, Dr. Durda Slavic, Ms. Deb van de Water	Integrating milk based cow and bulk tank test data, dairy cattle inventory data and GIS location data into the AHL surveillance capacity	2 yr
09-08	Dr. Hugh Cai, AHL	*Mycoplasma* speciation by molecular biology assays	2 yr
09-09	Dr. Hugh Cai, AHL Dr. Susy Carman, Dr. Josepha DeLay, Dr. Murray Hazlett, Dr. Beverly McEwen, Dr. Durda Slavic	Investigation of infectious etiology of small ruminant abortion in Ontario with emphasis on *Chlamydophila* spp. and *Coxiella burnetii*	1 yr
09-10	Dr. Hugh Cai, AHL Dr. Jinzhong Fu	Epidemiological analysis of *Mycoplasma bovis* isolated from Canada in the past 30 years	2 yr
09-11	Dr. Hugh Cai, AHL Dr. Andrew Peregrine	Development of molecular typing method for the characterization of *Giardia duodenalis*	2 yr
09-12	Ms. Kathy Zurbrigg, OMAFRA Dr. Beverly McEwen, Dr. Bruce McNab	Veterinary farm call syndromic surveillance	4 yr
09-13	Dr. Bob Friendship, OVC Dr. Rocio Amezcua, Dr. David L. Pearl	Refining the Ontario Swine Veterinarian-Based Surveillance (OSVS) system for real-time surveillance and integration with laboratory-based surveillance	1 yr

In addition, 4 new staff members have joined the AHSI project: **Ana Rita Rebelo** (Molecular Biology Laboratory Technician) and **Rebecca Travis** (Molecular Biology Method Development Laboratory Technician) reporting to Dr. Hugh Cai; **Sarah Hoyland** (Method Development Technician) reporting to Dr. Davor Ojkic; and **Jane Gaviller-Fortune** (Project Manager, AHSI) reporting to Dr. Grant Maxie. *AHL*

AHL Lab Reports

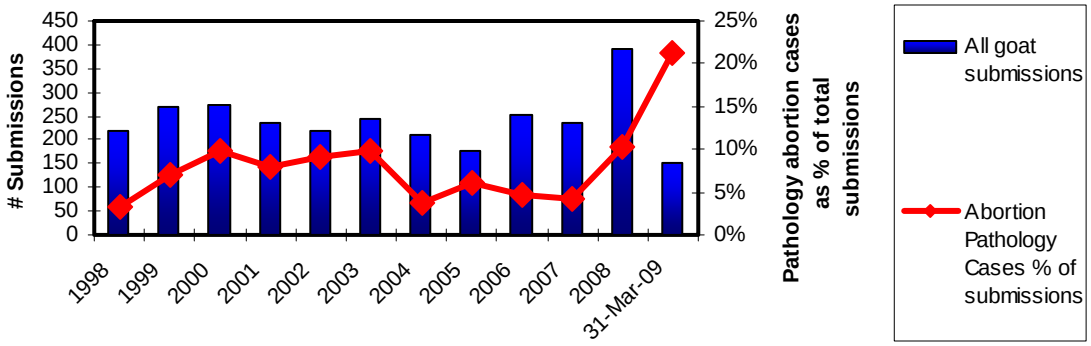
RUMINANTS

Goat submissions and abortions are increasing

Beverly McEwen, Durda Slavic, Josepha DeLay, Murray Hazlett, Margaret Stalker, Maria Spinato, Tony van Dreumel, Hugh Cai, Jan Shapiro, Brian Binnington, Paula Menzies, Susy Carman

Goat submissions, and the proportion of those submitted to AHL pathology as abortion cases have increased markedly, with the most dramatic increase in 2008 (Figure 1). The increase of submissions to the AHL may partially reflect the steady growth of the Ontario goat herd, which increased 22% from 2001 to 2006 (O'Brien A. State of the Ontario Goat Industry – Report 2007, OMAFRA Factsheet). The percent of those submissions that are abortions is likely inflated in January to March 2009 as most abortion cases are received from December to May.

Figure 1. Number of goat submissions and the percentage that are abortions submitted to AHL pathology, 1998 - 2009



The most commonly identified pathogens - *Chlamydophila abortus, Toxoplasma gondii, Listeria monocytogenes,* and *Coxiella burnetii* - are also zoonotic pathogens. Occasionally, *Toxoplasma gondii* plus *Chlamydophila abortus* or *Coxiella burnetii* are identified in a single fetus. **Submission of placenta optimizes the ability to identify abortifacient pathogens.** The AHL is currently validating IHC and PCR tests for *Chlamydophila* and *Coxiella* (see Cai, et al., p 9.) *AHL*

Table 1. AHL pathology cases, goat abortions, etiologic diagnosis, 1998 to March 2009

Etiologic diagnosis, per year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009, to Mar 31	Total
Idiopathic	2	11	14	8	9	16	2	3	3	5	17	12	102
Chlamydophila abortus	3	3	8	5	4	3	2	2	2	2	5	14	53
Coxiella burnetii	1	3	3	3	6	3	2	1	6	1	9	2	40
Toxoplasma gondii	0	1	2	1	0	1	1	1	2	1	4	4	18
Placentitis, idiopathic	0	0	0	0	0	0	0	0	0	0	4	4	8
Listeria monocytogenes	0	0	0	1	1	0	0	1	1	1	0	1	6
Bacteria other or unidentified	1	0	1	0	0	0	1	0	0	0	1	3	7
Fetal goiter (iodine deficiency)	1	0	1	1	1	1	0	0	0	0	1	0	6
*Campylobacter sp. (*C. jejuni)*	0	0	0	1	0	0	0	1	0	1*	0	0	3
Bovine viral diarrhea virus	0	0	0	0	0	1	0	2	0	0	0	0	3
Nutritional deficiency	0	1	0	0	0	0	0	0	0	0	0	0	1
Grand total	**8**	**19**	**29**	**20**	**21**	**25**	**8**	**11**	**14**	**11**	**41**	**40**	**247**

AVIAN/FUR/EXOTIC SPECIES

Isolation and identification of Duck adenovirus 1 in ducklings with proliferative tracheitis in Ontario

Marina Brash, Janet Swinton, Alexandru Weisz, Davor Ojkic *(in press, Avian Diseases, 2009)*

Increased mortality was reported in 2 flocks of Muscovy ducklings from 2 consecutive hatches originating from the same breeder flock. The same individual owned both duck flocks, but farms were managed by different individuals. Both flocks had a normal start for the first 5 days, and the rate of mortality started to increase at 6 days of age. One flock had elevated mortality of 2% over a 3-day period, and the other flock experienced 4% mortality in a 5-day period. Clinical signs were limited to the respiratory system with coughing, dyspnea and gasping observed in some ducklings between 6 and 11 days of age.

Opaque white plugs of exudate were seen in the tracheas, with some ducklings having multiple tracheal plugs. The tracheal mucosa was slightly congested and in some ducklings the lungs were also congested. Histologically, the tracheal and bronchial epithelium was hyperplastic, deciliated with a loss of goblet cells, and superficial epithelial cells contained large glassy eosinophilic intranuclear viral inclusions with peripheral margination of chromatin (Figure 1). The tracheal lumen contained fibrin and a mixture of degenerating inflammatory cells and desquamated epithelial cells with some bearing similar intranuclear inclusions (Figure 2).

Icosahedral viral particles, 60–70 nm in diameter were observed in tracheal epithelial cells by electron microscopy (Figure 3) and in the supernatant from cell cultures inoculated with filtered tracheal homogenates. The appearance and the size of the particles were typical of adenovirus. DNA sequencing and sequence analysis confirmed the virus that was observed in tracheal and bronchial epithelial cells and isolated from the tracheas of the sick ducklings was genetically indistinguishable from DAdV-1.

DAdV-1 infection of waterfowl, its natural host, is widespread and thought to be typically asymptomatic. **Our report confirms for the first time the presence of DAdV-1 in Canada and suggests that its pathogenic potential varies and can cause disease even in waterfowl**. In chickens and quail, DAdV-1 is referred to as Egg drop syndrome virus (EDSV) and causes egg production problems. EDS in chickens has not been reported in Canada but is included on the Canadian Food Inspection Agency's list of immediately notifiable diseases. **Our findings emphasize a potential risk this virus may pose and underscores the need for commercial poultry producers to continuously practice appropriate biosecurity measures to reduce the potential for introduction of pathogens from infected waterfowl into their commercial poultry flocks.** Furthermore, regional diagnostic laboratories should consider DAdV-1/EDSV during investigations of egg production problems. *AHL*

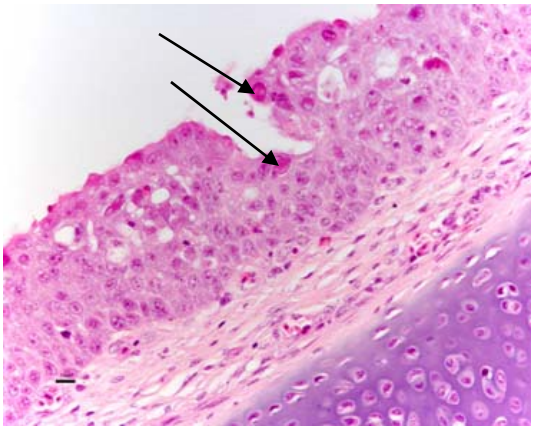


Figure 1. Multiple glassy eosinophilic inclusions in enlarged tracheal epithelial nuclei (HE stain, bar = 10 µm).

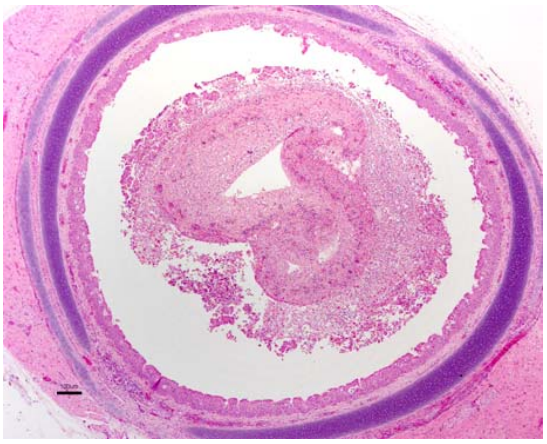


Figure 2. Proliferative tracheal mucosa with luminal exudate (HE stain, bar = 100 µm).

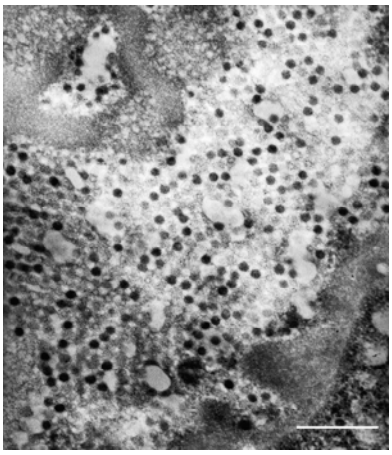


Figure 3. Electron micrograph of adenovirus particles measuring 60 – 70 nm (bar = 500 nm).

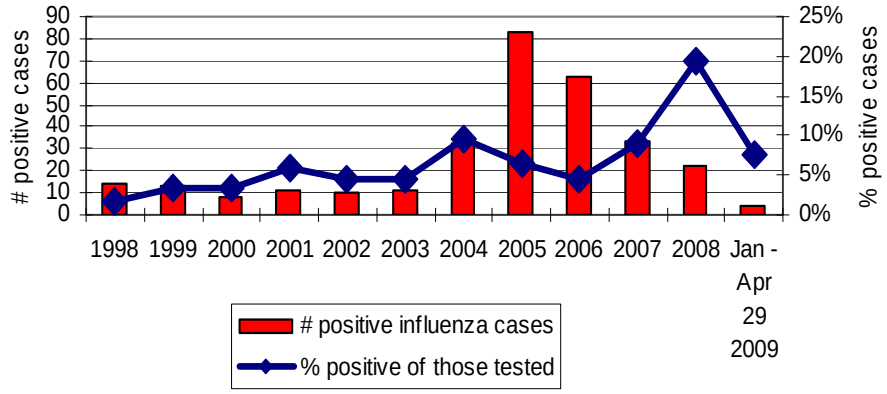
SWINE

Update on influenza virus isolates from Ontario swine, 1998 – April 2009

Beverly McEwen, Susy Carman, Davor Ojkic, Josepha DeLay, Murray Hazlett, Margaret Stalker, Hugh Cai, Jim Fairles

The AHL uses antigen detection ELISA, immunohistochemistry, fluorescent antibody tests, PCR, and virus isolation in cell culture and eggs to identify influenza virus in swine herds. **Using these virology tests, we have detected 304 virus-positive cases since 1998** (Figure 1). A positive case is defined as positive on at least one of the antigen detection tests listed above. These data are reliant upon submission biases and cannot be regarded as population prevalence estimates.

Figure 1. Number and percent positive of influenza cases identified in swine by antigen detection tests, AHL 1998 – April 29, 2009



Identification of influenza viruses in swine more than doubled in 2005, due to the outbreak of triple reassortant human-avian-swine H3N2 virus that swept across Canada in early 2005. H1N1 has not been isolated in Ontario swine from January to April 29, 2009. **It is important to type influenza virus, since pigs can act as "mixing vessels" for swine, avian and human strains of influenza virus.** The AHL now types influenza virus isolated using multiplex PCR and has subsequently forwarded many isolates to the University of Wisconsin, School of Veterinary Medicine, for sequencing all 8 gene segments.

Table 1 lists the total number of influenza viruses isolated by the AHL and typed by either the AHL or the University of Wisconsin. In addition to classical H1N1 swine influenza viruses, with all swine lineage genes, the AHL has recovered: 2 H3N2 viruses similar to those found in Quebec swine; a wholly human H3N2 virus (recovered in 1997); a wholly human H1N2 virus; a wholly avian influenza H4N6 virus; 2 wholly avian H3N3 viruses; human-swine reassortant H1N1 viruses; and human-swine reassortant H1N2. The current novel Mexican H1N1 viruses are different at the genetic level and can be differentiated from H1N1 viruses that were found to circulate in pigs in Ontario in past years - **the novel H1N1 virus has not been detected in pigs in Ontario as of the first week of May, 2009**. *AHL*

Table 1. Number and type of influenza viruses isolated from swine, AHL 1998 – April 29, 2009

Year	# Isolates	Influenza type					
		H1N1	H1N2	H3N2	H3N3	H4N6	Influenza A/Untyped
1998	13	12	0	0	0	0	1
1999	9	7	0	1	0	1	0
2000	6	6	0	0	0	0	0
2001	12	9	0	1	2	0	0
2002	12	9	0	0	0	0	3
2003	8	7	1	0	0	0	0
2004	14	11	1	0	0	0	2
2005	66	16	0	32	0	0	18
2006	51	31	0	18	0	0	2
2007	36	13	4	16	0	0	3
2008	19	5	0	10	0	0	4
Jan - Apr 29 2009	4	0	0	4	0	0	0

HORSES

Nutritional myodegeneration in an aged horse in eastern Ontario

Janet Shapiro, Carl McNicoll, Brent Hoff

A 15 yr-old paint mare was presented to the Animal Health Laboratory in Kemptville for necropsy in January 2009. She was kept outside with 5 another horses and 1 donkey, and was occasionally ridden lightly. The herd was fed first-cut round-bale hay.

The mare had a 3 day history of difficulty chewing and swallowing, a slow stiff gait, excessive recumbency and a listless demeanor. She passed dark red urine the first day signs were seen. Clinical examination showed mild dehydration, and slightly decreased borborygmus. There was moderate swelling of the right masseter muscle with no heat or pain, and no dental abnormalities. Abundant foamy saliva was observed, and tongue tone was mildly reduced. Serum creatine kinase was very elevated. There was no response to treatment with anti-inflammatory and antimicrobial drugs, DMSO, oral electrolytes and fluids, and intravenous lactated Ringer's solution. During the next 48 hr, the mare's condition deteriorated, and she was euthanized. Neurological disease was suspected.

Necropsy showed that the mare was in fair body condition. The right masseter muscle was pale, and there was edema of the overlying subcutis. Skeletal muscles were grossly unremarkable, but **there were numerous tan streaks and variable-sized pale areas throughout the myocardium**. The brain and spinal cord had no gross lesions. A severe infestation of bots was associated with ulceration of the gastric squamous mucosa and transmural gastric edema. Due to the history of difficulty masticating and swallowing, drooling, gait abnormality and recumbency, the brain was submitted for rabies testing, with negative results.

Histology of weight-bearing and non-weight-bearing muscles, masseter muscle, esophagus and heart showed severe generalized acute and subacute myofiber degeneration and mineralization, in some sections, affecting >85% of myofibers. Lesions in the heart had no apparent predilection for location relative to the endocardium, and the atria and ventricles were all affected. Mild acute multifocal aspiration pneumonia and mild acute myoglobin nephrosis were also seen. No lesions were detected in the brain or spinal cord.

The severe degeneration of the muscles of the head and esophagus was interpreted as the reason for difficulty masticating and swallowing, and may also have resulted in aspiration causing mild lung inflammation. The gait changes and recumbency were due to involvement of the skeletal muscles, and possibly weakness due to heart damage. Red urine resulted from release of myoglobin protein from damaged muscles. Generalized myonecrosis of striated and cardiac muscle in horses is most commonly due to vitamin E-selenium deficiency (nutritional myodegeneration) and ionophore toxicity; the latter occurs when horses eat feed or supplements prepared for ruminants or poultry, or when monensin is accidentally added to horse feed at the mill. Monensin toxicity seemed unlikely in this horse, as it was not fed grain or supplement. However, **selenium assay of the liver using spectrofluorophotometry gave a very low result** - 0.082 ug/g (adequate liver level is 0.3-1.0 ug/g). Serum selenium levels from the donkey and 2 other horses in the herd, none of which had clinical signs, were also very low, 0.015 ug/g, 0.088 ug/g, and 0.017 ug/g respectively (adequate serum level is 0.14-0.25 ug/g).

A presumptive diagnosis of nutritional myopathy was made based on the history, clinical signs, necropsy results, and selenium assays.

A presumptive diagnosis of nutritional myopathy was made based on the history, clinical signs, necropsy results, and selenium assays. **While these clinical signs, some suggestive of neurological disease, are commonly reported in foals diagnosed with nutritional myopathy, they are somewhat atypical for an adult horse.** Selenium supplementation and other adjustments to nutrition are in progress in this herd. *AHL*

Revised carcass disposal fees

As of May 1, 2009, carcass disposal fees for food animals and horses necropsied at AHL-Guelph will increase, due to higher deadstock removal costs. Revised fees from the May 1 2009, AHL User's Guide and Fee Schedule:

	Guelph	Kemptville
Carcass disposal, calf, pig, foal, sheep, goat (0-200 kg)	$12.50	$12.50
Carcass disposal, steer, heifer, sow, boar (200-400 kg)	$25.00	$18.00
Carcass disposal, cow (400+ kg)	$35.00	$18.00
Carcass disposal, horse (400+ kg)	$50.00	$35.00

Please note that these carcass disposal fees apply only to animals that are necropsied at the AHL. No disposal fee is charged for dogs, cats, or other small companion animals that are necropsied and forwarded for either mass cremation or private cremation. *AHL*

COMPANION ANIMALS

Four atypical presentations of canine hemangiosarcoma

Andrew Vince, Beverly McEwen

Hemangiosarcoma (**HSA**) is a common and commonly fatal malignancy of dogs. It is a neoplasm of endothelial cell origin that produces large, irregular, fragile blood-filled channels. Spleen and heart are the most typical sites of primary tumor development, though HSA is prone to broad metastasis. Review of AHL records from 1998 to May/09 yielded 473 cases in which HSA was the final diagnosis; 243 cases had splenic involvement and 186 had cardiac involvement (79 involved both heart and spleen); 58 cases involved skin, 47 involved kidney or retroperitoneum, 22 involved the central nervous system, and 21 cases involved skeletal muscle extensively - 253 cases were in male dogs, 207 in female dogs (in 8 the sex was unreported); the average age of affected dogs was 9.1 yr, the median age was 9 yr. Typical presentations involve sudden death or acute collapse related to peritoneal, pleural or pericardial hemorrhage (occasionally causing pericardial tamponade).

Given the propensity of HSA to wide dissemination, it is not unexpected that atypical presentations of this common disease might occasionally be presented.

Case 1 – Bilateral exophthalmos

An 11-yr-old female spayed Golden Retriever was presented because of lethargy, exercise intolerance over 4 wk, anemia, and thrombocytopenia. The dog had moderate exophthalmos, mild subcutaneous edema in the distal extremities, weak femoral pulses, and prominent popliteal lymph nodes. Radiology revealed mild cardiomegaly, mild diffuse bronchointerstitial pattern, and several splenic nodules. The dog was euthanized due to poor response to therapy and poor prognosis; at necropsy, disseminated red-black tumor nodules typical of HSA were found within the right auricle, spleen, liver, lung, kidney, subcutis, and mesentery, with **extensive body-wide infiltration of skeletal muscle, including the extraocular muscles of the eyes**.

Case 2 – Neurologic disease

A 9-yr-old male castrated Cardigan Welsh Corgi was presented because of collapse, lethargy, and inappetance. The dog had a right-sided head tilt, positional rotary nystagmus, decreased proprioceptive reflexes, tachypnea, tachycardia, and was mildly dehydrated; over the following 24 hr, neurologic signs progressed and responded only transiently to dexamethasone treatment. The dog died acutely of respiratory and cardiac arrest. There were **multifocal blood-filled cystic tumor nodules throughout multiple sections of brain examined** as well as tumor nodules typical of HSA throughout the lungs and adrenal glands. HSA was the most common diagnosis found in a retrospective examination of 177 secondary CNS tumors.

Case 3 – Thoracic wall mass

A 4-yr-old male castrated Golden Retriever was presented with a 24-hr history of pleural effusion and a firm mass on the right side of the thorax; the dog was bright, alert, responsive, with tachycardia, tachypnea, and increased respiratory effort. A 15 x 5 cm firm, non-movable mass was palpated on the right hemithorax, and heart sounds were muffled on the right hemithorax. Thoracocentesis yielded hemorrhagic fluid with an 18% hematocrit, total protein of 4.0 g/L. The owners elected euthanasia based on suspicion of a bleeding thoracic tumor. At necropsy, **coalescing, infiltrative, hemorrhagic masses were found extending through the right thoracic wall,** the largest measuring 20 cm in diameter. HSA tumor nodules were found throughout the lungs, pericardial sac, and diaphragm. Chondrosarcoma and osteosarcoma are the more likely thoracic wall tumors.

Case 4 – Cranial vena cava syndrome

An 11-yr-old female spayed Golden Retriever was presented with edema, starting with the larynx (causing dysphagia) and progressing to involve the neck, head, axilla, forelimbs, ventral thorax, and pleural space. Echocardiography and angiography demonstrated a mass within the lumen of the cranial vena cava; cytology of the mass provided a diagnosis of a sarcoma. Thrombosis developed after a vascular stenting procedure and clinical signs worsened. At necropsy, a single 4-cm diameter, round, solid mass was present at the junction of the cranial vena cava and the right atrium, extending into the lumen of the cranial vena cava, with an organizing thrombus extending the length of the cranial vena cava and right jugular vein. Histology demonstrated a solid spindle cell sarcoma without metastasis to other organs; immunohistochemistry for factor VIII-related antigen and CD31 were necessary to identify this as a HSA. Cranial vena cava syndrome as a result of this tumor has not been reported in the primary literature.

Hemangiosarcoma is a pleomorphic disease process. Most cases fit within 4 typical patterns of disease (cardiac, splenic, retroperitoneal/renal, cutaneous); however, by virtue of its aggressive patterns of systemic metastasis, **HSA should be considered a differential diagnosis for any disease syndrome that might be explained by a space-occupying lesion in any organ**. *AHL*