Laboratory Services Division
Animal Health Laboratory
University of Guelph
Changing Lives Improving Life

AHL Newsletter

Canada Post Publications number - 40064673

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In this issue:

AHL-Guelph Specimen Reception *Kris Lesniewski, Jim Fairles*

- Complement of 12 staff plus out-of-hours students.
- Client services veterinarian Dr. Jim Fairles provides expert advice on test selection and result interpretation.
- Staff accession 65,000 cases per year and route specimens to 12 different lab sections - some specialized testing is subcontracted. Staff also assist pathologists in the necropsy suite.
- Serve external clients, as well as UofG clients, including the OVC Health Sciences Center.
- Results are available on-line via the Web as soon as they are released by the labs. We send ~2/3 of our results by email, ~1/3 by fax, and a few by regular mail.
- Complete submission information is available in the print and e-versions of the AHL User's Guide and Fee Schedule - see http://www.guelphlabservices.com/AHL/

Left to right. Back row: Dr. Jim Fairles, Megan McAlpine, Josie Given, Bob Watkins, Dusica Malijkovic-Arizina.
Front row: Kris Lesniewski, Marianne Poschung, Dawn Scott, Rina Pigozzo, Robin Simkin.
Missing from the photo: Bevin Anderson, Keely McCarthy, Alma Mujakovic.

Request for pathologist's comments on peripheral blood smears:

We cannot accurately comment on peripheral blood smears without a complete hemogram and clinical history. As such, pathologist's comments are only available, at no additional charge, when a comprehensive CBC (test code *cbc*) is ordered.

Thank you. *Kris Ruotsalo*

EIAV reporting enhancements *Jim Fairles, Josie Given, Keith Harron, Davor Ojkic*

CFIA has made available additional options for sending EIA results to clients, including:

- **View on-line** and print the completed CFIA form through the AHL LIMS (Sapphire).
- Send completed EIA reports via **email**.

Once test results have been finalized, clients will continue to receive the standard AHL report indicating that the EIA test has been completed. This report will now say "**Results to follow and available on-line**". The traditional AHL method for the return of original documents is by Canada Post mail. EIA original forms will be returned by courier when requested on the top of the CFIA EIA form - there will be an additional charge of $5.25 per courier package.

In summary, the AHL now offers 5 methods to obtain EIA results:

1. **Canada Post mail** – standard (for original)
2. **Courier** (please indicate on the form, additional charge) (for original)
3. **On-line access** to results (for convenience - no need to call the lab)
4. **Fax** (please indicate on form and include fax number)
5. **Email** (please indicate on the form and include email address if different than the email address we have on file)

To activate on-line access , please contact us at ahlinfo@uoguelph.ca Telephone: 519-824-4120 ext. 54530.

Gas chromatography – mass spectrometry in AHL Toxicology

Nick Schrier, Brent Hoff

The gas chromatography – mass spectrometry (GC-MS) screening method plays an important role in the toxicology laboratory due to the technique's ability to screen for a large number of target compounds in samples that contain complex matrix interferences.

The mass spectrometer is the part of the instrumentation (Figure 1) that is used to identify the target compounds. Within the spectrometer, molecules are fragmented at a standardized energy and the mass of the fragments is determined. This fragmentation pattern (mass spectrum) is unique to the molecule and reproducible. **The production of standard mass spectra for specific molecules has allowed the compilation of mass spectrum libraries with >200,000 compounds.** Using these libraries, we are able to identify target compounds in a sample of interest.

Compounds that have historically been identified include drugs, vitamins, antibiotics, plant toxins, natural products, polycyclic aromatics, alkyl benzenes, pesticides, disinfectants, organophosphates, carbamates, organochlorines, and environmental pollutants.

This method does have limitations. Only compounds that are volatile (or can be made volatile) and thermally stable (will not break down when heated) can be analyzed by GC-MS. When possible, we suggest that the referring veterinarian supply a list of potential toxicants. This will allow us to determine if GC-MS analysis is the right analysis for your application. For the GC-MS screen, we require **25 g of tissue, feed or source material for analysis**.

Please do not hesitate to contact us (ahlinfo@uoguelph.ca) if you have any questions about this or other tests. *AHL*

Figure 1. GS-MS instrumentation

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Editor: **Grant Maxie,** DVM, PhD, Diplomate ACVP
Editorial Assistants: **Helen Oliver, April Nejedly**

The *AHL Newsletter* is published quarterly (March, June, September, December) by the Animal Health Laboratory, Laboratory Services Division, University of Guelph.

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

Mailing address & contact information:
(**please return all undeliverable Canadian addresses to**:)
Animal Health Laboratory
Laboratory Services Division, University of Guelph
Box 3612, Guelph, Ontario, Canada N1H 6R8
Phone: (519) 824-4120 ext. 54538; fax: (519) 821-8072
Email: holiver@uoguelph.ca

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Contributors to this issue:
From Laboratory Services / Animal Health Laboratory:
Marina Brash, DVM, DVSc, Diplomate ACVP
Susy Carman, DVM, Dip SA Med, PhD
Josepha DeLay, DVM, DVSc, Diplomate ACVP
Jim Fairles, DVM, MBA
Li Ge, BSc, MSc
Josie Given, AHT
Keith Harron, Assoc Dip Agr
Brent Hoff, DVM, DVSc DipTox
Kris Lesniewski, AHT, MLT
Anna Marom, BSc, MSc
Rebecca Marshall, BSc, MSc
Emily Martin, DVM, MSc, Diplomate ACPV
Davor Ojkic, DVM, PhD
Ana Rita Rebelo, BSc, MSc
Kristiina Ruotsalo, DVM, DVSc, Diplomate ACVP
Joanna Sawicki, BSc
Nick Schrier, MSc
Jan Shapiro, DVM, DipPath, DipEqSurg
Liliana Perez Toledo, BSc
Other contributors:
Kajal Devani, Canadian Angus Association, Calgary, AB
Musangu Ngeleka, DVM, PhD, Diplomate ACVM, Prairie Diagnostic Services, Saskatoon, SK
Rob Swackhammer, DVM, Rockwood, ON

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.

New real-time PCR tests at the AHL - available Sept. 1, 2012

Susy Carman, Ana Rita Rebelo, Joanna Sawicki, Li Ge, Rebecca Marshall, Anna Marom

Bovine

Real-time RT-PCR test for *Bovine coronavirus*

- Developed by the University of Minnesota, and validated for use at the AHL.
- For live animals with pneumonia, send nasal swabs in 0.5 mL saline.
- For live animals with diarrhea, send 5 mL of feces in a leak-proof container.
- From dead animals, send lung and colon, ileum, or jejunum.
- Samples can be pooled. Ship samples on ice packs. Testing is performed once per week.
- **The fee is $31.00 per test**.

Multiplex real-time RT-PCR test for ruminant *Rotavirus A* and *B*

- Developed by the University of Minnesota, and validated for use at the AHL.
- The PCR can be used to identify and type rotaviruses in the feces of cattle, sheep and goats.
- Send 5 mL feces, jejunum, or colon.
- Samples can be pooled. Ship samples on ice packs. Testing is performed once per week.
- **The fee is $31.00 per test**.

Real-time multiplex PCR test for *Bovine respiratory syncytial virus, Bovine herpesvirus-1 (Infectious bovine rhinotracheitis virus, IBRV),* and *Bovine parainfluenzavirus 3 (BPIV-3)*

- Testing can be done on nasal swabs from living animals or lung.
- Samples can be pooled. Ship samples on ice packs. Testing is performed once per week.
- **The fee for the multiplex is $65.00 per test**. **The fee for individual virus testing is $31.00 per test**.

Equine

Real-time RT-PCR test for *Equine arteritis virus*

- The AHL now offers a real-time RT-PCR for *Equine arteritis virus*.
- Testing can be done on nasal swabs, lung, or semen.
- Samples will be pooled. Ship samples on ice packs. Testing is performed once per week.
- **The fee is $38.00 per test**.

Swine

Real-time RT-PCR test for *Hemagglutinating encephalomyelitis virus* (HEV)

- Developed by the University of Minnesota and validated for use at the AHL.
- Send brain and tonsil.
- Samples can be pooled. Ship samples on ice packs. Testing is performed once per week.
- **The fee is $31.00 per test**.

Tetracore EZ-PRRSV MPX 4.0 multiplex real-time RT-PCR test for *Porcine reproductive and respiratory syndrome virus (*PRRSV)

- For the identification and typing of North American and European strains in a single assay.
- Uses additional multiple primer and probe sets to enhance the sensitivity of the PCR for the detection of ever-changing PRRSV strains.
- Samples can be pooled. Ship samples on ice packs. Testing is performed **daily**.
- **The fee per test is $25.50 for serum, $28.50 for saliva, $30.00 for semen, and $30.00 for tissues**.

For more information, please contact Dr. Susy Carman at 519-824-4120, ext 54551, or scarman@uoguelph.ca *AHL*

AHL Lab Reports

RUMINANTS

Osteopetrosis in Red Angus cattle

Josepha DeLay, Rob Swackhammer, Kajal Devani

A neonatal calf from a 60-cow Red Angus herd was submitted to the AHL for necropsy. The producer identified a shortened mandible in this calf and noted that 3 other calves with the same congenital anomaly had been born during the calving season, and all 4 affected calves had either been stillborn or died shortly after birth.

The female calf was of small stature, and the mandible was shortened by 3.5 cm in comparison to the maxilla (brachygnathia inferior, Figure 1). Lungs were aerated (floated in liquid), indicating that the calf was born alive and did breathe. Multiple ribs were fractured bilaterally, and intact ribs were brittle and easily fractured by digital manipulation. Multiple structural anomalies in brain included caudal herniation of the cerebellar vermis through the foramen magnum, bilaterally symmetrical compression of cerebral hemispheres and cerebellum, and flattening of the brainstem (Figure 2). Parietal, frontal, and sphenoid bones of the skull were thickened and misaligned, resulting in the compressive changes identified in brain. Multiple foci of acute hemorrhage in brain were most severe in cerebellar cortex and overlying meninges, corresponding to cerebellar herniation. In sagitally sectioned long bones, metaphyses were replaced by dense cores of bone with radial pale streaks (retention of primary spongiosa). Real-time RT-PCR for BVDV was negative on pooled tissues from the calf.

Bone lesions and resulting cerebral anomalies in this calf are consistent with osteopetrosis, a disorder of bone remodeling and development resulting from impaired osteoclast function and defective bone resorption. Both genetic and infectious (including BVDV) causes of osteopetrosis have been described. Osteopetrosis has been documented previously in Aberdeen Angus cattle in North America and in other beef breeds, and a resurgence of the condition in Red Angus cattle has recently been described in the western US and in Saskatchewan. In Red Angus, a deletion mutation in the SLC4A2 gene has been identified and results in loss of an ion exchanger protein required for osteoclast function. As a result of this deletion and defective osteoclast function, bone resorption and remodeling contributing to normal fetal development is remarkably impaired. The effects are systemic but are most dramatic in the fetal skull, where bone remodeling does not keep pace with brain growth and development. Compression of brain parenchyma and cranial nerve foramina by the abnormally sized and shaped calvaria is suspected to cause sufficient neurologic injury to result in fetal death. Affected calves are typically aborted in late gestation or are stillborn.

The Canadian and US Angus associations utilize a DNA test for this mutation to identify and monitor carrier animals, and discourage the propagation of this gene into the commercial sector. Subsequent to necropsy examination of this calf, DNA testing determined that both the sire and dam were carriers of the deletion mutation, **confirming this as the first recent case of hereditary osteopetrosis in Red Angus cattle in Ontario**. *AHL*

Reference: O'Toole D, et al. Veterinary Pathology (Online First), July 18, 2011, http://vet.sagepub.com

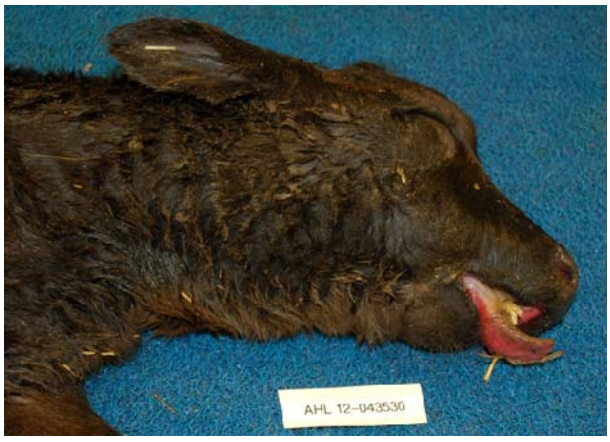


Figure 1. Osteopetrosis - neonatal Red Angus calf with prominent brachygnathia inferior.

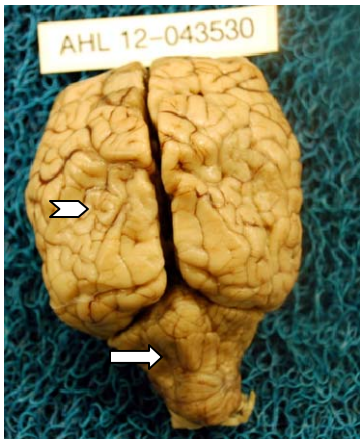


Figure 2. Brain of neonatal Red Angus calf with osteopetrosis – compression of parietal cortex (arrowhead) and cerebellum (arrow), with caudal displacement of cerebellar vermis.

SWINE

Malignant catarrhal fever in pigs on a hobby farm in eastern Ontario

Jan Shapiro, Josepha DeLay, Musangu Ngeleka

In April 2012, a 7-month-old Tamworth boar, purchased from Quebec about 7 weeks prior to death, was submitted for necropsy to the Animal Health Laboratory (AHL) in Kemptville, Ontario. The boar was from a small mixed-species hobby farm, one of 6 pigs in the herd; other species on the farm included sheep, a llama, 2 cows and a calf. The pigs were housed full-time in individual adjoining pens in a small barn and fed a commercial sow ration. The sheep flock consisted of 60 ewes, 3 rams and 50 lambs. Sheep were housed in a barn approximately 13 meters away from the pig barn, with no direct contact and no direct air flow between sheep and pigs. However, the premises of origin in Quebec had both pigs and sheep, and they had been housed in the same building.

The boar had been healthy until becoming acutely febrile and anorexic. It was treated with 2 antibiotics over the next 4 days, and with Banamine (flunixin meglumine) for the last 2 days, with no improvement in clinical signs, and died on the 5th day of illness. No other pigs were affected.

Necropsy showed that the boar was in good body condition. There was mild fibrinous polyserositis, with strands and clumps of fibrin on the liver, intestinal serosa, and the right cranial lobe of the lung. The tracheal mucosa was diffusely moderately congested, and there was mucopus in the distal trachea. The right cranial lung lobe was firm and lobules were variegated red and dark red-black. Bronchial lymph nodes were mildly to moderately diffusely hyperplastic. There was moderate diffuse splenomegaly. A systemic bacterial infection had been suspected from the gross necropsy, but bacterial culture of lung and spleen yielded negative results.

Histopathology showed dramatic multisystemic vasculitis, predominantly affecting small and medium caliber blood vessels, and consisting of perivascular and intramural infiltration with lymphocytes, smaller numbers of histiocytes, and small numbers of granulocytes, usually neutrophils. Some vessels also showed intramural and perivascular fibrin exudation, a small amount of intramural pyknotic debris, and thrombosis. Acute multifocal necrosis, interpreted as secondary ischemic necrosis, was observed in lung, lymph nodes, heart and kidney. Additional histological diagnoses were mild nonsuppurative meningoencephalitis, mild acute fibrinopurulent bronchopneumonia, chronic interstitial nephritis, and nonsuppurative endocarditis.

Tissues were submitted to the National Animal Diseases Laboratory in Winnipeg for testing for classical swine fever and African swine fever, and results were negative. In addition, immunohistochemistry for *Bovine viral diarrhea virus*, *Porcine circovirus 2* (PCV-2) and *Porcine reproductive and respiratory syndrome virus* was performed at the AHL. Results were negative except for the PCV-2 test, in which very sparse and localized, somewhat atypical, staining for PCV-2 antigen was present within macrophages around the periphery of 1 of 2 sections of lymph node. No staining was evident in sections of brain, lung, kidney or heart.

Paraffin blocks, which included sections of lymph nodes, spleen, liver, kidney, heart, brain and lung, were submitted to the molecular diagnostics laboratory of Prairie Diagnostic Services for testing for sheep-associated malignant catarrhal fever (SA-MCF) using both the conventional and TaqMan real-time polymerase chain reaction (PCR) specific for *Ovine herpesvirus 2* (OvHV-2). **All tissues were strongly positive on both PCR tests, supporting the diagnosis of porcine malignant catarrhal fever caused by OvHV-2.**

MCF is a generalized disease caused by a gammaherpesvirus, which primarily affects ruminants such as cattle, bison and deer. In ruminants, most cases have been associated with OvHV-2, for which sheep are the natural host. However, infected sheep only very rarely show clinical signs themselves. **Porcine MCF is very rare, reportedly occurs only sporadically, and usually affects only a single pig in a herd. The etiological agent, OvHV-2, is thought to be spread from sheep to pigs by contact with infectious nasal secretions of young sheep**. It has been reported in Europe since the early 1900s, but was only reported in North America in 2009, occurring in 2 herds on small farms located in New York and Kentucky. In both those cases, affected pigs were in close proximity to sheep, and sheep were believed to be the source of the virus. Clinical signs in pigs are nonspecific, and may include high fever, depression, anorexia, dyspnea, and neurological signs. Death usually occurs after 2-4 days, regardless of treatment.

There is no vaccine for MCF in any species, and the only known method of prevention of this disease is not to allow pigs and sheep to share close environments. Infected pigs are dead-end hosts, and do not spread the disease to other pigs. The low incidence may reflect the fact that commercial swine operations do not allow contact or commingling with sheep, and perhaps that pigs have a low susceptibility to this infection. MCF does not pose a significant threat to commercial swine operations.

To the best of our knowledge, this is the first report of porcine MCF in Canada. *AHL*

HORSES

Equine testing available at the AHL

Jim Fairles, Josie Givens

The AHL is a full-service accredited lab that offers a wide range of tests for the equine practitioner - from biopsies to gene sequencing. Below is an overview of the tests performed in-house - various other tests are sent to subcontracting labs.

For complete information, please refer to the AHL User's Guide and Fee Schedule. Please feel free to contact us at ahlinfo@uoguelph.ca for on-line access. *AHL*

ACTH (adrenocorticotropic hormone) - chemiluminescence
Anticoagulant screen (brodifacoum, bromadiolone, chlorophacinone, diphacinone, pindone, warfarin) - HPLC
Antimicrobial susceptibility, MIC
Bacterial culture, aerobic and anaerobic, *C. difficile, C. perfringens*, MRSA, *Salmonella*
Baermann, pepsin, standard
Biochemistry profile, full, hepatic health, presurgical, renal health - photometric
Botulism
Bovine papillomavirus - PCR
CBC, comprehensive, with manual diff, TS
Chlamydophila (Chlamydia) spp - PCR
Cholinesterase, blood, brain - UV colorimetric
Coagulation profiles (PT, PTT, FDP, fibrinogen)
Coombs' test, direct, indirect
Cortisol - chemiluminescence
Crossmatch, equine
Cushing's profiles
Cyanide, plant tissue
Cytology, bone marrow, fluids, smears
D-dimer - *under development*
Dicoumarol - HPLC
E. coli, ETEC (enterotoxigenic) - genotyping
EIAV - ELISA
Electrolyte profile (Na, K, Cl) - ISE
Equid herpesvirus 1/4 – IHC, PCR, VN, isolation
Equid herpesvirus 2 - VN, isolation
Equid herpesvirus 3 - isolation
Equine adenovirus - isolation
Equine arteritis virus (EVA) - isolation, PCR, VN - *NEW*
Equine encephalitis virus, EEE - IHC, PCR
Equine respiratory serology panel - VN
Equine rhinitis A virus - VN, isolation
Equine rhinitis B virus - VN, isolation
Ergot - qualitative
Ethylene glycol - GC/MS
Fecal egg count – McMaster, Wisconsin
Fecal flotation, equine
Feed additive screen (monensin, narasin, salinomycin) - HPLC
Foal IgG - CITE ELISA
Fructosamine - photometric
GI flush/sieve/worm count
Giardia duodenalis - genotyping
Haptoglobin - photometric
Histopathology, necropsy, mail-in/biopsy - Guelph and Kemptville
Immunohistochemistry (IHC) multiple cell markers, infectious agents
Influenza A virus, equine - antigen ELISA, PCR, HI, isolation
Insulin - chemiluminescence, *RIA under development*
Iron & TIBC - photometric
Lawsonia intracellularis – PCR
Lead, blood, tissue
Leptospira, companion/other animal - MAT
Mineral panel, heavy metals, trace elements
Mycology - fungal culture, ID
Mycoplasma culture, speciation, MIC
Mycotoxins
Necropsy - Guelph and Kemptville
Nitrate
Parasite identification
Pesticide screen, organochlorine, organophosphate
Progesterone (P4) - chemiluminescence
Protein electrophoresis - agarose gel
Rotavirus A - latex agglutination
Saline wet mount
Selenium
Serum amyloid A (SAA) - photometric *NEW*
Skin or skin scraping - digestion for parasites
Streptococcus equi ssp. equi - seM and szp gene strain sequencing typing
Sucrose wet mount
Thallium
Thyroid profiles, fT4d, TT4
Tissue search, parasites
Toxicant screen - GC/MS - *NEW*
Urinalysis
Urine chemistry profile (Na K Cl creatinine Ca P) - photometric
Urine myoglobin - electrophoresis
Virus isolation by egg inoculation, in cell culture
West Nile virus - PCR

New virus neutralization assay using serum for the determination of antibody titers to *Equine arteritis virus*

Susy Carman, Liliana Perez Toledo

- The AHL now offers a virus neutralization assay using serum for the determination of antibody titers to *Equine arteritis virus*.
- Paired acute and convalescent sera from the same animal are required for the serological diagnosis of recent infection.
- Send 1 mL of each serum. Ship samples on ice packs. Testing is performed once per week.
- **The fee is $15.00 per test**.

For more information please contact Dr. Susy Carman at 519-824-4120 or scarman@uoguelph.ca *AHL*

AVIAN/FUR/EXOTIC SPECIES

Infectious bronchitis in chickens – current isolations at the AHL

Emily Martin, Davor Ojkic, Marina Brash

In the last few months, the AHL has had multiple submissions from chicken flocks of multiple commodities that have varying histories that include increased mortality, tracheitis, pneumonia, and nephrosis. After histology and/or PCR testing, it was discovered that these cases were positive for *Infectious bronchitis virus* (IBV).

Infectious bronchitis (IB) is caused by a coronavirus that is highly contagious and causes acute disease. Transmission is via the respiratory tract by inhalation or direct contact with contaminated poultry, litter, or equipment. The incubation period is short, with clinical signs developing in 24-48 hours post exposure. In young birds, the clinical signs can range from reduced weight gain and feed efficiency to respiratory disease (gasping, coughing, sneezing, tracheal rales, nasal discharge) and depression. Secondary infections include bacterial septicemia (airsacculitis, pericarditis, perihepatitis).

There are different IBV strains and these can have varying virulence and different tissue tropisms (respiratory, kidney, gonad). Mortality depends on the virulence of the strain, age, immune status, and stresses. Mortality can be up to 30% and peak at 5-6 weeks of age. In IBV strains that are nephropathogenic, renal lesions and renal disease can cause up to 25% mortality. Birds can recover from the respiratory phase of disease only to show signs of depression, ruffled feathers, wet droppings, increased water intake and mortality. Young birds are most susceptible to infection, and resistance increases with age. Virus can be re-excreted post-infection or post-vaccination, with periodic shedding in nasal secretions and feces. IBV can be isolated from species of birds other than chickens, but these birds are generally not clinically affected. It is possible that other breeds of birds could act as vectors of IBV.

On gross post mortem, lesions include serous, catarrhal or caseous exudate in the trachea, nasal passages and sinuses; airsacculitis ranging from foamy/cloudy air sacs to air sacs containing caseous exudate; and swollen, pale kidneys with tubules and ureters distended with urates. Samples to collect at necropsy include trachea, lung, kidney, oviduct, and cecal tonsil. In the first week of an infection, the virus can localize in the trachea but it is cleared early on. In longer term infections, the virus tends to localize in the intestines making the cecal tonsils better samples in these cases.

On histopathology, there is tracheitis, airsacculitis, pneumonia, interstitial nephritis, and urate nephrosis. The histology of the current cases showed very mild tracheal lesions with germinal centres in the lamina propria, and mild interstitial nephritis and renal tubular necrosis. Differential diagnoses include Newcastle disease (*Avian paramyxovirus 1*), ILT (infectious laryngotracheitis), low pathogenic avian influenza, and infectious coryza (*Avibacterium paragallinarum*, formerly *Haemophilus paragallinarum*).

From the current AHL submissions, 6 IBVs from broilers were genotyped by spike (S1) protein gene sequencing. S1 sequences from all 6 viruses were different from those previously reported in Canada. One virus showed the highest identity to a variant IBV previously described in California and 5 viruses appeared to be highly related to IBV strain 793/b that has not previously described in North America, but in Europe and Asia. Further studies are being undertaken to investigate these findings. *AHL*

Feline myeloma - continued from p. 28

Myeloma typically occurs in aged cats with no sex or breed predilection. Clinical signs are variable with anorexia and weight loss being most common. Skeletal lesions are uncommon in cats. Hypercalcemia is common in dogs, but uncommon in cats with myeloma. Hypercalcemia may be due to osteoclast-activating factor or other cytokines produced by neoplastic plasma cells. Hypercalcemia may be exacerbated by associated renal disease.

It has been recently reported that in cats, extramedullary involvement of myeloma is more common at initial clinical presentation than it is in human myeloma patients. As well, extramedullary involvement of well-differentiated tumors in cats is also more common than in humans. These findings contrast the human myeloma model which suggests that the initial neoplastic transformation of cells occurs in the bone marrow with subsequent involvement of other sites, and provide supportive evidence for primary extramedullary development of myeloma in cats.

The prognosis for myeloma in the cat is not as favourable as in the dog. Most cats transiently respond to chemotherapeutic protocols, but these responses are not durable, with most patients unfortunately succumbing within 2-3 months.

Following the diagnosis of myeloma, this patient was started on a course of chemotherapy (dexamethasone and cyclophosphamide). Within 1 week, the hypercalcemia had resolved, and within 2 weeks serum globulin values were back within reference intervals. The submandibular mass had regressed. Clinically, the cat also exhibited improved appetite and increased energy level. **Unfortunately approximately 3 weeks thereafter, the cat began to fail, with a recrudescence of the submandibular mass noted**. Euthanasia was elected. *AHL*

COMPANION ANIMALS

Case report: Feline myeloma *Kristiina Ruotsalo*

An 18-year-old spayed female, domestic short-haired cat was presented with a history of inappetance and decreased energy. A mass in the left submandibular region was noted on physical examination. Serum biochemistry was unremarkable except for the presence of hypercalcemia (ionized calcium of 2.21 mmol/L, reference interval 1 -1.4 mmol/L), and hyperglobulinemia (total serum globulins 73 g/L, reference interval 27-48 g/L). CBC was unremarkable except for a moderate to marked, non-regenerative anemia (hemoglobin 51 g/L, reference interval 93-153 g/L).

Serum protein electrophoresis revealed a single, large, narrow-based peak in the gamma globulin region, consistent with a monoclonal gammopathy.

Abdominal ultrasound examination revealed a slightly mottled appearance to the spleen with a single, hypoechoic nodule identified. Fine needle aspirates of the bone marrow, spleen, and submandibular mass were undertaken.

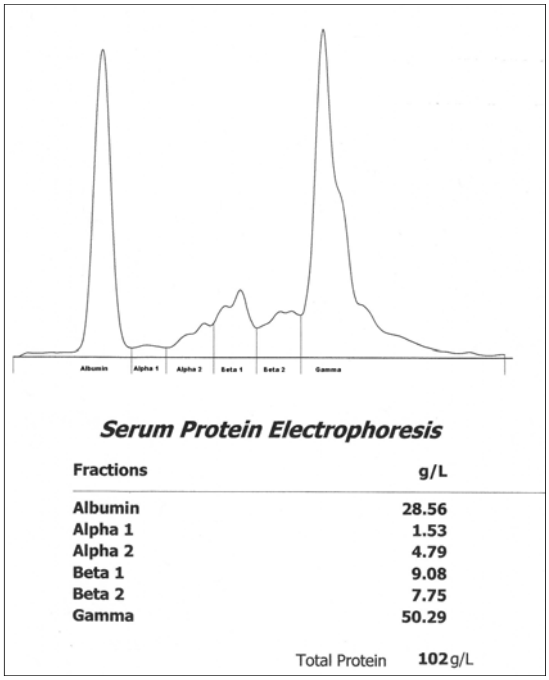
The bone marrow aspirate was highly cellular and contained occasional erythroid and myeloid hematopoietic precursors but was almost completely replaced by a population of round cells consistent with a plasma cell origin (Figure 1). Morphologically, these cells ranged from almost cytologically unremarkable plasma cells to large atypical cells with an increased nuclear to cytoplasmic ratio with variable amounts of basophilic cytoplasm. Nuclei were round with single to multiple, prominent nucleoli. Multinucleation was frequently noted. Mitotic figures were common. Marked anisokaryosis and anisocytosis were evident.

The splenic aspirate contained evidence of mild extramedullary hematopoiesis as well as low numbers of atypical plasma cells, similar to those noted within the bone marrow.

The submandibular aspirate contained low numbers of highly atypical plasma cells as well. It was not evident if these cells were effacing a regional lymph node or if this represented cutaneous extramedullary infiltration of neoplastic cells.

A diagnosis of myeloma (intramedullary and extramedullary) was made.

Myeloma related disorders are rare in cats, accounting for approximately 0.0012-0.0025% of all feline malignancies examined in 2 case series reports. Myeloma has not been associated with either FeLV or FIV infection, and is the result of neoplastic transformation of a plasma cell or immunoglobulin secreting B lymphocyte precursor, resulting in the overproduction of a single type or component of immunoglobulin (paraprotein). Rarely, biclonal immunoglobulin production occurs. In humans and dogs, the diagnosis of myeloma requires the presence of plasma cells in the bone marrow (greater than 30% of total cell numbers), and demonstration of at least one of the following criteria: 1) serum paraprotein, 2) immunoglobulin light chain (Bence Jones) proteinuria, or 3) a lytic bone lesion. *Cont'd on p. 27*



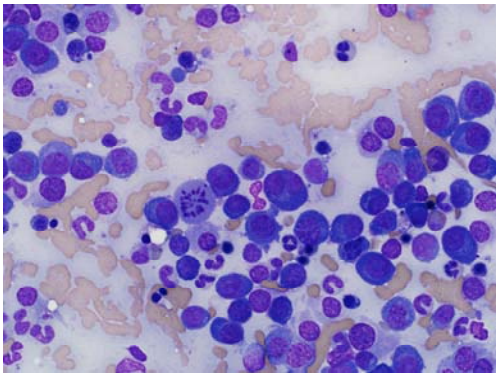


Figure 1. Bone marrow aspirate from a cat with myeloma.