Diagnostic Update

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Welcome to Liz Dobbin: New Director of AVC Diagnostic Services

By Shelley Burton, Veterinary Clinical Pathologist

The Atlantic Veterinary College (AVC) Diagnostic Services Laboratory recently welcomed Ms. Liz Dobbin into the newly created role of full-time Director of Diagnostic Services. Liz started in this position in April, but is no stranger to us, as she had acted as manager of our laboratory for a 9 month period in 2001. We remembered her leadership and excellent contributions from that time and were delighted to welcome her back!

Liz is originally from Kensington, PEI, and has spent her career on the Island. She is a registered Medical Laboratory Technologist with additional impressive credentials. These consist of numerous management and laboratory certifications, diplomas and degrees, including a recent Master of Business Administration degree. For the past 11 years, she was Manager of the PEI Cancer Treatment Centre at the Queen Elizabeth Hospital in Charlottetown. In this role, she had a spectrum of leadership and management activities, ranging from designing a comfortable home-like interior for patients to managing communications, a complex budget and over 70 staff. Most noteworthy, she fostered the development of a collaborative team for patient care, including oncologists, a social worker, a dietitian, nurses and spiritual care counselors. This was so successful that other cancer treatment centres across Canada used it as a model and frequently travelled to PEI to see Liz and her team in action.

With her many talents, we were certainly lucky to recruit Liz into her current role. She was drawn to return to the AVC to work again with colleagues who she describes as wonderful and devoted. Liz is also enjoying being in an academic environment again, where she and her staff can experience learning opportunities. Finally, her fondness for animals has made working in the veterinary field very fulfilling and interesting.

When not working, Liz enjoys gardening and travelling as well as family time with her husband, Greg, and their girls, Madison and Hilary. Also included in the family is their cat, Oliver, and their 2 dogs, an Australian Shepherd named Ossie and a Chihuahua named Chompi. Liz reports that Chompi has the notable characteristic of frequently climbing on the Ossie's back to escape the cold floor!

Liz had the opportunity to meet many practitioners and technicians at our exhibit booth at the Atlantic Provinces Veterinary Conference in Halifax in April. She tremendously enjoyed this and hopes to meet many more in the next few months as she explores ongoing improvements to our service. Please feel free to contact Liz to say hello, ask questions or provide her with any feedback on the AVC Diagnostic Services Laboratory. She can be reached at edobbin@upei.ca or 902-566-0831.

Iron Deficiency Anemia: A Brief Review and Select Testing

By Noel Clancey, Veterinary Clinical Pathologist

A 5 year old castrated male Siberian Husky dog presented with a 2 month history of neck pain to the Atlantic Veterinary College Teaching Hospital. During these 2 months, the patient was receiving a common non-steroidal anti-inflammatory drug (NSAID) combined with a muscle relaxant which was controlling the dog's pain. A complete blood count (CBC) revealed a marked anemia with marked microcytosis, marked hypochromasia and moderate regeneration (Figure 1). A low serum iron concentration (3 µmol/L, reference interval = 14.5 – 22 µmol/L) was consistent with iron deficiency anemia. Several foci of petechiation were observed endoscopically in the small intestine, and enteritis and gastritis with fibrosis were diagnosed histologically. The source of the iron deficiency anemia was felt to be due to gastrointestinal tract (GIT) bleeding secondary to chronic NSAID therapy. The NSAID was discontinued and the patient treated for GIT ulceration and supplemented with iron. The anemia diminished and the serum iron concentration increased. The patient was clinically well at discharge with neck pain well controlled using a µ-opioid receptor agonist.

Iron deficiency anemia occurs when body stores of iron are depleted. This results when dietary intake does not meet body demands or when there is chronic external blood loss. Lack of dietary iron intake is rare in veterinary medicine with the exception of nursing animals due to low iron concentrations in milk. Commercial pet foods provide adequate iron; however, cats and dogs receiving home-made or vegetarian diets not supplemented with iron can potentially develop iron deficiency. Chronic blood loss is a far more common source of iron deficiency. Causes of external blood loss include endo- and ecto-parasitism, GIT hemorrhage, thrombocytopenia, thrombocytopathias, inherited hemostatic disorders, epistaxis, hematuria, excessive or chronic phlebotomies and hemorrhagic cutaneous disease.

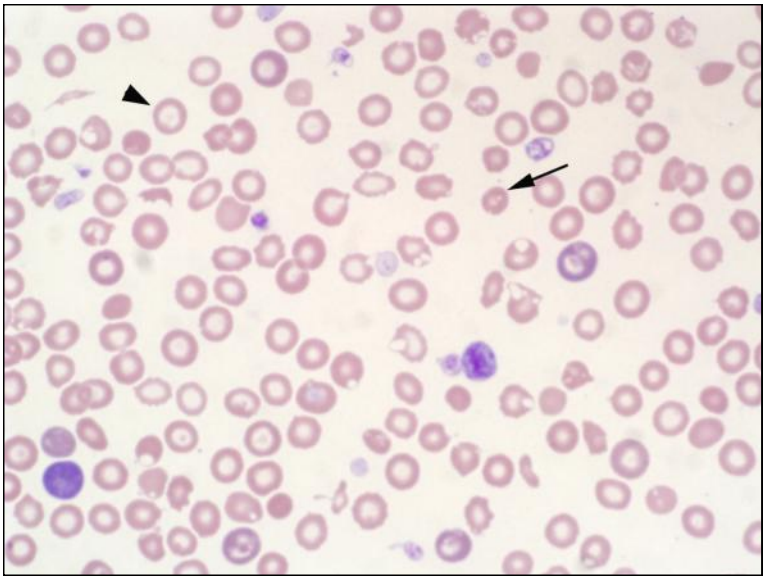

Figure 1: Blood smear with microcytic (arrow) and hypochromic (arrowhead) RBCs. Wright-Giemsa, x 100 objective.

The development of iron deficiency anemia from chronic blood loss usually takes weeks to months. Initially, anemia does not develop as long as compensatory erythropoiesis using stored iron replaces lost erythrocytes. Stored iron is primarily found in the liver, bone marrow and spleen. Ferritin is the main iron storage protein; it is mostly located in tissues but small amounts can leave cells and enter plasma. The other major source of stored iron is hemosiderin found in macrophages present in the liver, bone marrow and spleen. While iron deficiency anemia is traditionally considered non-regenerative, it is often regenerative during the acute stages of chronic blood loss. However, following prolonged blood loss and depletion of body iron stores, effective erythropoiesis decreases and a non-regenerative anemia ensues.

Microcytosis and hypochromasia are classical CBC findings associated with iron deficiency. These develop due to defective heme synthesis caused by the lack of iron. Because adequate cytoplasmic hemoglobin concentration signals the end of cell division, iron-deficient erythrocytes undergo additional mitoses, leading to smaller erythrocytes (microcytes). Hypochromasia occurs because the amount of available iron is insufficient for incorporation into heme for hemoglobin production. Microcytosis indicated by a decreased mean cell volume (MCV) usually precedes hypochromasia indicated by a decreased mean cell hemoglobin concentration (MCHC).

While changes in the RBC indices such as decreased MCV and MCHC serve as initial indicators of iron deficiency anemia, iron status can be further investigated by measuring serum iron concentration. Serum iron concentrations are typically low in iron deficiency and in inflammatory diseases. However, other causes of decreased serum iron include exogenously administered corticosteroids in ruminants and accelerated erythropoiesis, particularly when erythropoietin is given without supplemental iron. Serum iron concentration can be increased with hemolytic anemia, iron supplementation or overload, recent blood transfusions and corticosteroid administration in dogs and horses.

Total iron binding capacity (TIBC) is the maximum concentration of iron that can be bound to blood transport proteins; it reflects the capacity to carry iron. In an effort to carry available iron to cells, the TIBC should theoretically increase in iron deficiency. While this test is routinely used in human medicine, iron-deficient dogs typically do not have increased TIBC. Additionally, the TIBC does not dramatically change in disease and does not reflect tissue iron stores. Therefore, the TIBC is not used as a sole means of measuring iron status, although it is often still included on an iron panel.

Iron from bone marrow, spleen and liver aspirates and biopsies can also be assessed for hemosiderin using Prussian blue stain as a subjective assessment of iron status. Furthermore, the marrow of cats typically does not contain stainable iron using routine stains, excluding the use of marrow to assess iron stores in this species unless Prussian blue stain is used. Iron-deficient patients lack stainable marrow iron stores but a lack of stainable iron does not necessarily predict iron deficiency.

The acute phase protein ferritin correlates well with tissue iron stores in domestic animals. This test is species-specific and assays are available for horses, cats and dogs. Increased serum ferritin can be seen with hemolytic disease, hepatic disease, excess iron administration, exercise in horses and neoplasia, particularly histiocytic sarcoma. Serum ferritin is particularly useful when attempting to distinguish iron deficiency anemia from anemia of inflammatory disease. While serum iron concentration is low in both conditions, serum ferritin is decreased in iron deficiency anemia and increased with anemia of inflammatory disease.

Table 1: Comparative iron profile results between iron deficiency anemia and anemia of inflammatory disease.

	Serum Iron	Serum TIBC	Stainable Iron in Marrow	Serum Ferritin
Iron Deficiency	↓	WRI to ↑	↓	↓
Inflammation	↓	WRI to ↓	↑	↑

An excellent review of iron deficiency anemia can be found in the 2012 March edition of The Canadian Veterinary Journal (53 (3):250-256).

Farewell to Dr. Noel Clancey

By Cornelia Gilroy and Shelley Burton, Veterinary Clinical Pathologists

We want to wish Dr. Noel Clancey all the best as he leaves the Atlantic Veterinary College (AVC) Diagnostic Services and begins a new chapter in his career this fall with BattLab, a diagnostic veterinary laboratory in Coventry, United Kingdom.

Dr. Clancey has been a part of the clinical pathology team since September 2008 after he completed a 3 year combined Master of Veterinary Science and Residency in clinical pathology here at the University of Prince Edward Island. During his time working at the AVC, he has been instrumental in maintaining the quality of our clinical pathology service through his hard work and dedication as a diagnostic clinical pathologist. Many of you will have spoken to him if you have called to speak to a clinical pathologist in the past 5 years. In addition to his time spent interpreting samples, Dr. Clancey has been a key player in the validation of newly acquired instruments, quality control, teaching senior veterinary students, providing continuing education, contributing to Diagnostic Update and being involved with the Veterinary Laboratory Association Quality Assurance Program. His position at the AVC was unfortunately not renewed due to budgetary reasons. While Noel is looking forward to the challenges of his new position, he is definitely sad to be leaving his friends and colleagues here. He also has tremendously enjoyed interacting with regional veterinarians and wishes to thank them for some great discussions over the years.

We will miss Noel not only for his clinical pathology skills but for his good humor, collegiality and love of movies. Some of his other interests are photography and travel, both of which he will hopefully be able to devote time to in his new surroundings. We will miss him but hope Noel and his cat, Hobbes, will have a great time exploring their new English home.

The Story Continues: Methicillin-Resistant Staphylococci in Atlantic Canada, Part 2.

By Matthew Saab, MSc Student and Veterinary Public Health Technologist

In the August 2011 issue of Diagnostic Update, we described the current state of knowledge of emerging antimicrobial resistant pathogens to small animals, methicillin-resistant staphylococci. Under the guidance of my supervisor, Dr. J T. McClure, of the Veterinary Public Health Laboratory, I have conducted research to further understand the complexity of this organism and its role and implications to the health of companion animals in the Atlantic region. We would like to update you on methicillin-resistant staphylococci, as the isolation of these bacteria is of considerable concern to veterinary clinicians and their clients.

Previously, we explained a new taxonomic classification for coagulase-positive staphylococci in companion animals, the *Staphylococcus intermedius* group (SIG), and the challenges surrounding its identification using traditional biochemical tests. To refresh your memory, the SIG consisted of three species: *S. delphini*, *S. intermedius* and *S. pseudintermedius*. Molecular work using a multiplex polymerase chain reaction (PCR) determined that the methicillin-resistant SIG recovered in specimens submitted to the Diagnostic Bacteriology Laboratory are *S. pseudintermedius* and not *S. intermedius*. This provides evidence that the SIG diversity in Atlantic Canada is no different than what is being seen worldwide: *S. pseudintermedius* is isolated primarily from dogs, *S. intermedius* only from feral pigeons and *S. delphini* from mustelids (mink, ferrets and badgers). To be consistent with the literature and other diagnostic laboratories, the Diagnostic Bacteriology Laboratory at the AVC will be reporting all non-*S. aureus* coagulase-positive staphylococci isolated from dogs as *S. pseudintermedius*, and MRSP (Methicillin-resistant *Staphylococcus pseudintermedius*) will be reported for its methicillin-resistant counterpart.

At the AVC Diagnostic Bacteriology Laboratory, we have seen a steady increase in the number of MRSP cases over the past three years. Most importantly, between 2010 and 2011 we saw a significant increase in the number of cases: in 2010, we had a total of 8 MRSP cases, and in 2011 that number increased to 38 positive cases. In 2012, we saw 48 positive cases. We are continuing to see a rise in the number of cases, and generally identify about 1 MRSP case per week. We primarily isolate MRSP from samples from dogs with skin diseases such as pyoderma, but we have also isolated it from samples involving cases of otitis, cystitis, infected wounds and surgical site infections.

Working with the Atlantic Veterinary College – Veterinary Teaching Hospital (AVC-VTH), I am investigating whether MRSP positive patients are contaminating the hospital environment. Using pulsed-field gel electrophoresis, patient MRSP strains were compared to MRSP strains that were isolated from AVC-VTH areas where the same positive patient was housed or treated. Results provide evidence that a few patients have contaminated the hospital environment. This work highlights the importance of proper cleaning and disinfection of hospital areas between patients and suggests that the hospital environment is a potential source of infection. It is important to note that no area was released for use until MRSP was no longer detected in the environment, thus preventing infections in other patients.

I am also evaluating the use of a selective culture medium to detect MRSP in canine clinical specimens. The recovery of MRSP using the routine diagnostic method is being compared to using this selective MRSP medium and broth. If successful, the use of this selective media could allow a preliminary result to be available within 24 hours. Currently, it takes at least 48 hours to detect MRSP, especially if sub-culturing is needed from an initial mixed bacterial growth upon culture. I am optimistic that the research I am doing will help our Diagnostic Bacteriology Laboratory in providing superior service in identifying this important bacterial pathogen and we will continue to update you as new information becomes available.

Diagnostic Services is Pleased to Announce Saturday Service

By Liz Dobbin, Director of Diagnostic Services

Beginning Saturday, August 3rd, 2013, Diagnostic Services will provide diagnostic testing services on Saturday mornings from 8:00 am to 12:00 pm. Midland Courier will pick up laboratory specimens on Fridays for delivery to the Atlantic Veterinary College on Saturday mornings. On your Midland weigh bill please indicate Saturday delivery under special instructions. We hope that our new hours will help to meet your testing needs. If you have any questions or comments please contact Liz Dobbin, Director of Diagnostic Services, by phone at 902-566-0831 or by e-mail at edobbin@upei.ca . Unfortunately, Edmundston and Yarmouth cannot be serviced by Midland for Saturday delivery.

AVC Diagnostic Services at the 2013 Atlantic Provinces Veterinary Conference

By Noel Clancey, Veterinary Clinical Pathologist

Figure 1: Our Diagnostic Services booth at the APVC. Dr. Andrea Bourque, Ms. Liz Dobbin and Dr. Noel Clancey are visiting with Dr. Jane Corkum (3rd from left) from Nova Scotia.

Diagnostic Services Director, Ms. Elizabeth Dobbin, along with Dr. Andrea Bourque and Dr. Noel Clancey were pleased to represent Diagnostic Services at an exhibition booth during the annual Atlantic Provinces Veterinary Conference in Halifax, Nova Scotia. We would like to thank everyone who invested time to stop by the booth and say hello. Diagnostic Services was pleased to offer three draw prizes. Congratulations to our winners:

- First Prize of two complimentary biopsies: Cindy Rodgerson from Sackville Animal Hospital, Lower Sackville, NS.
- Second Prize of two complimentary cytologies: Taylor Josey from Complete Care Hospital for Pets, Lake Echo, NS.
- Third Prize of one complimentary complete blood count, chemistry profile and endocrinology test: Alyson Sperian from Oromocto Veterinary Clinic, Oromocto, NB.

Figure 2: Dr. Gary Conboy and Ms. Nicole Murphy were the providers of the parasitology wet laboratory session.

Dr. Gary Conboy and Ms. Nicole Murphy provided a well received wet laboratory session on fecal examination techniques and parasite identification entitled “Parasitology – Species in the Feces”.

We look forward to seeing everyone again next year!

Inflammatory Bowel Disease - Unease for Patient and Pathologist Alike

By Shannon Martinson, Veterinary Anatomic Pathologist

Among the common submissions to our histopathology service are gastrointestinal (GI) mucosal biopsies collected by endoscopy. While some diagnoses, especially neoplasia, may be made from these samples with relative ease, more often the disease in question is inflammatory bowel disease (IBD). The term IBD is used to refer to a group of idiopathic chronic gastrointestinal disorders characterized by mucosal inflammation. While the cause is unknown, an altered interaction between gut microbes and the mucosal immune system is believed to play an important role. In dogs, genetic factors must also be considered as certain breeds (Basenjis, Shar Peis, German Shepherd dogs, Boxers and Rottweilers) appear to be at increased risk of developing this disease. The diagnosis of IBD has been a source of contention for veterinary pathologists for years.

I often wonder if clinicians feel the same apprehension in collecting and submitting these small endoscopic gastrointestinal biopsies as I occasionally do in receiving them. Why do these small biopsies create such trepidation? There are several reasons.

One important limitation is related to sample quality: the gastrointestinal tract is a difficult site to sample and, as such, diagnostic specimens are hard to achieve by endoscopy. While pathologists prefer full-thickness biopsies collected via laparotomy (if you give us an inch, we'll take a mile!), we appreciate that endoscopy is less invasive, less risky to the patient and allows evaluation of the mucosal surface by the clinician.

Recent guidelines from the World Small Animal Veterinary Association (WSAVA) Gastrointestinal Standardization Group suggest that to compensate for the shallow nature of mucosal biopsies, the number of samples collected per site should be relatively high (6 to 28) to optimize the amount of tissue evaluated. In this way, sampling of lesions, which can be multifocal even within a segment, is more likely. This also helps to ensure that sufficient samples of adequate quality are submitted. Samples consisting only of the tips of the villi, a common shortcoming of endoscopic collection, are deemed inadequate (Figure 1). It has also been suggested that collecting samples from the ileum may provide valuable information not always gained from evaluation of segments of stomach, duodenum or colon (the more commonly sampled sites).

Endoscopic biopsies are small and delicate and can easily be damaged during collection, fixation and processing. To avoid artifact, these samples must be carefully removed from the biopsy forceps to avoid tearing and stretching of the tissue and placed into formalin before they dry. You may notice a comment in the report you receive from the pathologist regarding submission quality. This line is provided to allow you to gauge our level of confidence in the histopathological findings.

While histopathologic evaluation is required to make a diagnosis of IBD, no universally accepted histologic grading system exists for this purpose, thus creating another source of ambiguity for pathologists. There is great variation in the number of leukocytes within the GI lamina propria at different sites and among individuals, making it difficult to differentiate between normal leukocyte populations and mild inflammatory changes. Like many organs, the GI tract has a limited ability to respond to insults. Therefore, many inflammatory diseases at this site look identical histologically. Added to that, the apparent lack of correlation between severity of clinical signs and degree of inflammation makes histologic interpretation a major challenge. I think that this uncertainty is often reflected in our diagnosis and in the comment sections in our reports, likely much to the frustration of clinicians.

The WSAVA Gastrointestinal Standardization Group suggests that the criteria for diagnosing IBD should include (1) chronic (> 3 weeks) persistent or recurrent GI signs; (2) histopathologic evidence of mucosal inflammation; (3) inability to document other causes of GI inflammation; (4) inadequate response to dietary, antibiotic and anthelmintic therapies alone; and (5) clinical response to anti-inflammatory or immunosuppressive agents. Histopathological change in the absence of the other criteria does not allow a diagnosis of IBD; this diagnosis is one of exclusion.

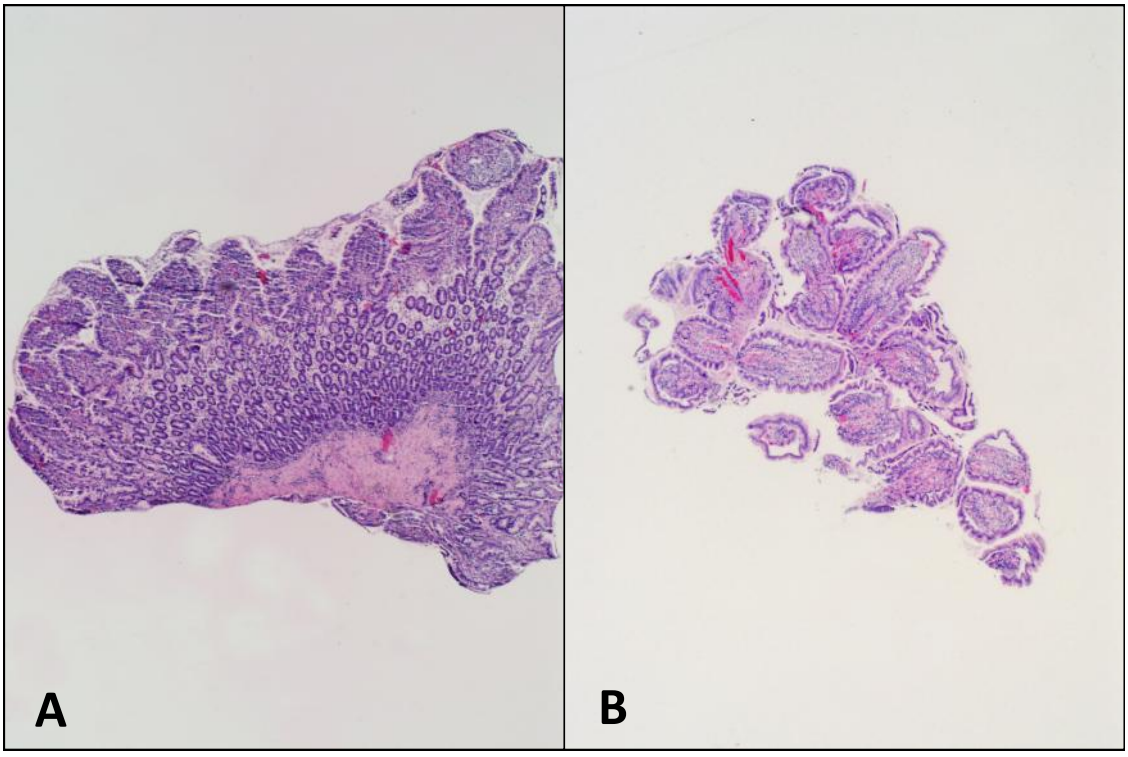

Figure 1: A: An adequate tissue sample including at least 3 villi and extending to the depth of the muscularis mucosa, allowing full-thickness evaluation of the mucosa. **B:** An inadequate tissue sample consisting of only the tips of the villi. H&E, x 4 objective.

Because IBD is a diagnosis of exclusion, the WSAVA Gastrointestinal Standardization Group has suggested that for patients with clinical signs of less than 3 weeks duration and in relatively good health (little weight loss, normal serum albumin concentrations, no lethargy, no anorexia, etc.), more consideration should be given to therapeutic trials rather than endoscopic biopsy.

However, in more clinically ill animals, it is more reasonable to perform biopsies prior to therapeutic trials. In 2008, the same group developed objective "microscope-side" guidelines for grading inflammatory changes in the stomach and intestine in the hopes of improving consistency amongst pathologists. Only once consistency is achieved can we see if these guidelines allow a better correlation of histology with clinical disease.

With all of this in mind, I try to remember that the histologic observations that I make when evaluating endoscopic GI biopsies are intended to be used as one piece of a larger puzzle. When considered in this perspective and using the objective guidelines provided by the WSAVA Gastrointestinal Standardization Group, my anxiety in receiving these samples is alleviated. I only hope that clinicians understand the reluctance of pathologists to simply offer a diagnosis of IBD without clinical information or good quality samples. Pathologists and clinicians working together will provide the best situation for patients who may have this challenging to diagnose disease!

Reference:

1. Day MJ, Bilzer T, Mansell J, *et al*. Histopathological standards for the diagnosis of gastrointestinal inflammation in endoscopic biopsy samples from the dog and cat: a report from the World Small Animal Veterinary Association Gastrointestinal Standardization Group. *J Comp Path*. 2008; 138: S1-S43.
2. Washabau RJ, Day MJ, Willard MD, *et al*. Endoscopic, biopsy, and histologic guidelines for the evaluation of gastrointestinal inflammation in companion animals. *J Vet Intern Med.* 2010; 24: 10-26.

Laboratory News

By Cornelia Gilroy, Veterinary Clinical Pathologist

Here are some recent happenings in Diagnostic Services:

- We welcomed our new director of Diagnostic Services, Ms. Liz Dobbin, to the Atlantic Veterinary College (please see full article on page 1).
- Several members of Diagnostic Services travelled to Halifax to participate in the Atlantic Provinces Veterinary Conference, including a parasitology wet laboratory provided by Dr. Gary Conboy and Ms. Nicole Murphy (please see full article on page 5).
- Dr. Noel Clancey, veterinary clinical pathologist, was one of three speakers to provide continuing education in March at the Atlantic Veterinary College as part of an oncology workshop.
- We want to wish Dr. Noel Clancey farewell as he has left Diagnostic Services and will be beginning a new job in the United Kingdom with BattLab (please see full article on page 3).
- We wish all the best to Dr. Rick Cawthorn, veterinary parasitologist, who recently retired after 27 years of service at the University.
- Congratulations to Dr. Dania Villarnovo, our clinical pathology resident upon the completion of her Master of Veterinary Science (MVSc). She is entering her third and final year of residency training in clinical pathology so you may see her name frequently on clinical pathology reports!
- We want to welcome our most recent anatomic pathology resident and MVSc student, Dr. Fany Marron.
- Wildlife Anatomic Pathology resident Dr. Heather Fenton has recently completed her Master of Veterinary Science (MVSc) and her residency and is studiously preparing for the rigorous American College of Veterinary Pathologists certifying examination in mid-September. Congratulations and all the best, Heather!
- The Canadian Animal Health Laboratorians Network (CAHLN) annual meeting was held in Saint-Hyacinthe, Québec from May 26-29, 2013. Representatives from Diagnostic Services included Dr. Carmencita Yason, Ms. Liz Dobbin and Ms. Robyn MacPhee.
- We want to welcome back Dr. Sandra McConkey as a veterinary clinical pathologist in Diagnostic Services! This will be in addition to her role as a veterinary clinical pharmacologist.

Staff Focus

Dr. Paul Hanna

By Cornelia Gilroy, Veterinary Clinical Pathologist

Dr. Paul Hanna is well recognized by veterinarians in Atlantic Canada and beyond for his passionate teaching and his many years of service as a veterinary anatomic pathologist. As such, Dr. Hanna has recently been recognized for his 25 years of dedicated work for the Atlantic Veterinary College (AVC) at the University of Prince Edward Island (UPEI)!

Dr. Hanna is originally from Stayner, a small rural town in southern Ontario. He attended the Ontario Veterinary College to obtain his Doctor of Veterinary Medicine degree from the University of Guelph in 1982. Dr. Hanna proceeded directly into a one year combined internship and Diploma of Veterinary Pathology degree course; he then moved to Prince Edward Island in 1983 to work as a pathologist with the Department of Agriculture. With the opening of the AVC in 1986, Dr. Hanna worked for 1 year as a contract pathologist, sessional lecturer and supervisor of morphologic pathology at the AVC before pursuing a Master of Science degree, which he obtained from UPEI in 1989. In 1991, he became a boarded Diplomate by passing the certifying examination from the American College of Veterinary Pathology.

Dr. Hanna's role since then included being an adjunct professor and contract pathologist with the Department of Pathology and Microbiology from 1989 until 2002, after which he was hired as an associate professor and earned tenure in 2005. In addition, he served as Director of Diagnostic Services from 1992 to 1996.

As an anatomic pathologist, Dr. Hanna has a special interest in dermatopathology and is actively involved in necropsy and biopsy cases. Dr. Hanna enjoys passing his expertise on to others through the instruction of veterinary students and in the training of pathology residents. His enthusiasm as an instructor is renowned and he has been the recipient of several teaching awards, including the 2012 Pfizer J. Norden Distinguished Teacher Award, the highest teaching award given by North American veterinary colleges!

Paul's other interests include travelling, woodworking, recreational running and cycling. Paul also enjoys spending time with his family which includes his wife Ginny, his grown children Ben and Emily, as well as with his stepdaughter Gillian and her son Ethan. Paul and Ginny like walking with their 2 somewhat neurotic but lovable Yorkshire terrier dogs, Gus and Ollie. Paul is used to being teased about the manliness of sharing his life with such tiny dogs, but he insists that they are actually quite tough and think they are as big as Great Danes!

Reader Feedback: The ***Diagnostic Update*** group invites comments or suggestions for future topics in the newsletter. Please submit your comments to *Dr. Cora Gilroy* (cgilroy@upei.ca), Diagnostic Services, Atlantic Veterinary College, UPEI, Charlottetown, PE, C1A 4P3 and they will be forwarded appropriately.