Bellwether Magazine

Volume 1
Number 47 *Summer 2000*

Article 7

7-1-2000

23rd Annual Feline Symposium

Joan Capuzzi
University of Pennsylvania

The Twenty-Third Annual Feline Symposium was held on March 25, 2000 at VHUP. The event was well attended and supported by Sheba® and Mrs. Robert V. Clark, Jr. and Mrs. Edith M. Young. Mr. Richard Gebhardt again narrated the Parade of Breeds. Following are summaries of the presentations.

Update on the Renal Transplant Program

Kidney transplantation is the freshest approach used to combat the most pervasive—and perhaps deadliest—disease in geriatric cats: renal failure. Dr. Lillian Aronson, assistant professor of surgery at VHUP, discussed the methodology and potential complications of renal transplantation, and data from the first two years of the program at VHUP.

VHUP's renal transplantation program began in early 1998. Since then, 30 cats (25 domestic shorthairs and five purebred cats) diagnosed with end-stage renal failure have received kidney transplants here. The causes of renal failure in these cases included chronic interstitial nephritis (50%), nephroliths and/or ureteroliths of kidneys/ureters (20%) polycystic kidney disease (7%) and unknown in 6 cats.

Careful patient selection is crucial to a successful medical outcome of renal transplantation, Dr. Aronson explained. Kidney recipients must be healthy; preoperative tests include routine bloodwork, FELV/FIV test, serum T4, urinalysis and urine culture, chest/abdominal radiographs, echocardiography and abdominal ultrasound.

Prior to surgery, recipient cats are given a protein-restricted diet, phosphate binders, blood transfusions to correct any anemias, and intravenous fluids. Immunosuppression, which reduces the likelihood of organ rejection, is accomplished by the administration of cyclosporine and prednisone, started two days prior to surgery.

The surgeries on the donor and recipient cats are performed simultaneously. The donor cat is brought into the surgical area 30-45 minute prior to the recipient. Once the donor vessels and ureter have been prepared for a nephrectomy, the recipient is brought into surgery and prepared to receive the kidney. The renal vessels are anastomosed (end-to-side) to the recipient's aorta and caudal vena cava. A ventral midline cystotomy is then done, and the ureteral mucosa is attached to the bladder mucosa. One of the native kidneys is biopsied and a gastrostomy tube placed. The incisions are closed and the recipient is taken to the intensive care for close monitoring. The donor recovers in the regular fluid ward.

"The key to success with these patients is intensive post-operation management to try to prevent complications," Dr. Aronson said. "Furthermore, she added, the owner needs to realize that this is a commitment for the life of the cat." This commitment includes continual immunosuppressive therapy and regular visits to the referring veterinarian for bloodwork and evaluation.

Dr. Aronson cited some statistics regarding postsurgical outcome in kidney transplant patients at VHUP. Nineteen of the 30 cats that have received kidney transplants at VHUP are currently alive and thriving; sixteen of these are over one year post-transplant. Complications in the surviving cats include three cases of diabetes, possibly associated with chronic immunosuppressive therapy, and one case of a parathyroid gland tumor; the tumor has been removed and the cat is doing well.

Of the cats that are no longer alive, three died in the perioperative period prior to discharge—one from a possible coagulopathy, one from hypotension associated with a hemoabdomen, and the third from pancreatitis and pleural effusion. Seven cats died following discharge—two from calcium oxalate stone formation in the new kidney (14 month and two years, post operatively), three from infection secondary to immunosuppressive therapy, two cats with system toxoplasmosis infection four months and six months post-op, one cat from an infection of her peg tube site, one from ureteral obstruction secondary to scar tissue formation at the graft site, and one of possible poor owner compliance.

Among all the cats receiving renal transplantation at VHUP, the postoperative complications that were treated successfully included renal infarction, saddle thrombus, seizures, bladder atony and associated ureteral obstruction, and fever of unknown origin.

Renal transplantation is a revolutionary development in feline medicine. When tethered to careful case selection, postoperative intensive care, and early recognition of complications, renal transplantation can restore quality—and quantity—of life to cats in renal failure.

FELV and FIV—Differences and Similarities

Feline leukemia virus (FeLV) and feline immunodeficiency virus (FIV) cause immunodeficiency syndromes that can greatly impact the quality of life of our cats. Dr. Lesley King, associate professor of critical care at the School, explained the differences and similarities between FeLV and FIV.

Three subfamilies of retroviruses are important in domestic cats: the spumaviruses, which typically do not cause disease; the oncornaviruses—like FeLV—which potentially cause immunosuppression and cancer; and the lentiviruses—or "slow" viruses—such as FIV, which cause immunosuppression. The latter two viruses are quite pathogenic in cats.

"The viruses FeLV and FIV certainly cause some of the most serious health problems that we see in cats today," Dr. King said.

Both viruses consist of a RNA core, which is surrounded by structural

proteins and protected by a lipoprotein envelope. This envelope consists of antigens, such as the gp70 molecule in the case of FeLV, which enable the virus to attach to and infect the host cells.

"Cats' cells have specially designed receptors on their surfaces to link into this virus," Dr. King explained. "The two have evolved together over probably thousands of years."

Once the FeLV or FIV viruses attach to cell membrane receptors, they penetrate the target cell and shed this envelope. Using the enzyme reverse transcriptase, a DNA copy of the viral RNA is made. A provirus is then formed and integrated into the cat cell DNA. Following integration, most cat cells then replicate the virus.

Both fragile viruses, FeLV and FIV are readily inactivated by heat, desiccation and light. They are not transmitted by transient contact with other cats or with fomites, such as cages or brushes. Hence, owners need not delay before introducing a new cat into a household formerly occupied by an infected cat.

FeLV is present in high concentration in the saliva and respiratory secretions of infected cats. Transmission requires prolonged, intimate, moist contact between cats, such as occurs when cats groom each other. In single-cat households where there is no known exposure to the virus, infection incidence is less than one percent. In exposed multi-cat households, the rate is 28 percent. Amongst the stray cat population, nearly one percent of cats are infected with FeLV.

FIV, which replicates in the salivary glands, is also shed in large quantities in the saliva. Unlike FeLV, it is not easily transmitted by prolonged, intimate contact, such as grooming. Transmission occurs primarily through bites. Disease incidence is highest amongst those cats that are more prone to fighting, such as male and stray cats. Amongst free-roaming cat populations, disease incidence is as high as 17 percent. In confined cat populations, such as catteries, it is about one percent.

FeLV replicates in the pharynx and local lymph nodes. Once transmitted, one of three things happens. In cats with good immune function that are exposed to small quantities of virus, viral antibodies against the gp70 antigen are formed, infection is eliminated, and lifetime immunity develops (42 percent of exposed cats). If the inoculum is large or the cat is immunosuppressed, the virus spreads hematogenously to other sites, particularly the intestines and the bone marrow (28 percent of exposed cats). These cats, 85 percent of which die within 3.5 years of diagnosis, are capable of transmitting the virus to other cats. Alternatively, in about 30% of cats the virus dies out and is eliminated from the cat, but the cat does not develop an immune response and is susceptible to re-infection in the future. In a small percentage of exposed cats, latent infections can occur in which the virus is present in the cat but not replicating. Latent infections can potentially revert to viremia and disease if the cat becomes stressed.

In the case of FIV—the feline counterpart to human immunodeficiency virus (HIV)—the host is infected for life. Following inoculation, a fever, enlarged lymph nodes and a transient drop in the white blood cell count occur about four weeks after infection. These low-grade signs may persist for several months, after which time the cat appears normal, even though the virus is still replicating in its system. Eventually these cats develop immune deficiency, after which mean survival time is an estimated two years.

FeLV and FIV cause a host of clinical signs. "The most important thing that these retroviruses do to cats is cause a dramatic and profound immunosuppression," said Dr. King.

Cats infected with either virus are prone to the development of opportunistic infections, such as hemobartonellosis and demodectic mange. FeLV can also cause malignant mutations resulting in lymphoma and leukemia; other problems include anemia, enteritis, infertility/abortion, and skeletal and neurologic abnormalities. FIV infection, on the other hand, is characterized by gingivitis/stomatitis and neurologic signs. Infected cats are also prone to respiratory and intestinal tract disease and skin lesions.

FeLV is diagnosed by antigen tests (ELISA or IFA), and positive results are obtained only when the virus is actively replicating. Negative results to these tests therefore occur in cats with latent infections. False positives may occur with ELISA testing, and should be confirmed with IFA. A third test, polymerase chain reaction (PCR), can theoretically detect virus in latently infected cats that are negative on ELISA and IFA. Positive results may also be seen during the acute phase of FeLV infection; if this scenario is suspected, these cats should be retested two to three months later.

In the case of FIV, antibodies may not be present until six weeks after infection, but then the cat will remain positive for life. The ELISA test is highly sensitive for FIV antibodies, and the Western blot test is thought to be the definitive test.

There are no "cures" for FeLV or FIV. However, immunomodulator therapies and reverse transcriptase inhibitors (i.e., AZT) may be used to manage infection or delay the spread of the virus.

For both viruses, prevention is key, Dr. King said. This involves preventing cats from roaming free and, in the case of FeLV, vaccinating. Dr. King also recommended a stepwise program for removal of FeLV from catteries: Test all cats for FeLV. Remove infected cats, clean all dishes and other fomites, and prevent movement of cats in or out of the cattery. Retest all cats 12 weeks after the first test to detect incubating infections. Lift the quarantine once all cats have had tested negative on two consecutive tests, and test all new cats prior to introduction.

Feline Blood Types and Histocompatibility Issues

Blood type compatibility is crucial to the success of a transfusion, as well as to the health of a newborn kittens. Dr. Urs Giger, Charlotte Newton Sheppard Professor of Medicine at the School, gave the symposium lecture on feline blood types, and discussed their pertinence to transfusion medicine and cat breeding.

Presently, only one blood group system is recognized in cats. The AB blood group system has three blood types: A, B and AB. The type A allele is dominant over the B allele and the AB type is separately inherited. Of these, type A is the most prevalent, and type AB by far the rarest. The occurrence of type B blood varies in frequency by breed and geographic region.

In a study of feline blood groups conducted by Dr. Giger's laboratory at the School, over 15,000 cats have been typed since 1986. In the northeastern part of the country, nearly every cat has type A blood, type B cats comprise 0.3 percent of the population, one to two per-

Mrs. Clark and Mrs. Young Honored

At the 23rd Annual Feline Symposium Dean Kelly honored Mrs. Robert V. Clark, Jr. and Mrs. Edith Young for their support of the School and the Feline Symposium. He presented the Bellwether Medal to each. Following are the citations:

Elizabeth Dunn Clark

Elizabeth Dunn Clark, for more than three decades you have been a compassionate and generous supporter and a most valued ambassador to the University of Pennsylvania School of Veterinary Medicine. Four School deans have cherished your wonderfully devoted friendship and ardent spirit. They have valued your enthusiastic dedication to animal health concerns.

You have rescued and cared for a multitude of unwanted and neglected animals, numbers too great to estimate, and have been a tenacious advocate for animal welfare. Myriad humane organizations have benefitted from your magnanimous generosity and sage guidance in their endeavors.

An exhibitor of Labrador retrievers and a renowned breeder, you have set the highest standard of excellence for the dog fancy to exemplify. Springfield Farm's champion Labradors, in addition to nine other breeds, have been prominently honored over the years in shows throughout the United States.

Mrs. Young, Dean Kelly, Mrs. Clark.

Integrally involved over the past two decades to the growth and success of the School's Feline Symposium, Elizabeth Dunn Clark and the Feline Symposium are synonymous. You have contributed immensely to the dissemination of feline health issues and concerns shared with breeders and feline owners through this important educational symposium.

Elizabeth Dunn Clark, in recognition of your accomplishments for all animals and their welfare and on the occasion of the 2000 Feline Symposium, the University of Pennsylvania School of Veterinary Medicine presents to you the Bellwether Medal.

Saturday, March 25, 2000
School of Veterinary Medicine Feline Symposium 2000

Edith M.Young

Over many, many years, Edith M.Young, you have graced the School of Veterinary Medicine and its leadership with your incredible Scottish humor and zestful spirit. We are delighted to embrace you as one of our special friends. As a loyal supporter over the past three decades, we are particularly proud to call you our international ambassador.

Your earnest pursuit of the dissemination of feline health issues and concerns shared with breeders and feline owners through the Feline Symposium, have earned you the respect of your peers. Your outstanding involvement has been a major component of its success and your participation on the Committee has been invaluable.

Rescuing and caring for unwanted animals, here and abroad, you have been a staunch and successful promoter for animal welfare. Many humane societies are grateful for your munificence and counsel in their endeavors. Your extraordinary thoughtfulness has served as an example for others to emulate. We are grateful for your boundless concern and consideration for all animals and your selfless support of all organizations dedicated to animal interests.

In recognition for your participation and counsel to the Feline Symposium Committee, and in particular to the School of Veterinary Medicine, we present to you, Edith M.Young, the University of Pennsylvania School of Veterinary Medicine's Bellwether Medal.

Saturday, March 25, 2000
School of Veterinary Medicine Feline Symposium 2000

cent in the south were type B, and four to six percent in the west. In other parts of the world, type B domestic shorthair cats are far more prevalent. For example, in France and Italy, over ten percent of cats have blood type B, and one region of Australia has 26 percent.

Just as marked is the variation in blood type frequencies by breed. The Penn study found that among Siamese and related breeds of cats, the type B blood type does not exist. In Maine coon and Norwegian forest cats, type B blood was found in low percentage, and in breeds like Abyssinians, Birmans and Persians, in about 15 percent. Among breeds like the Devon, Cornish rex, British and exotic shorthair cats the type B frequency is a striking 30+ percent.

Stray, anti-A antibodies, which are present in all type B cats, are responsible for two life-threatening conditions: transfusion reactions and neonatal isoerythrolysis (NI). Type A cats have low titers of anti-B antibodies in their plasma, which can cause the former condition but not the latter.

Blood transfusions are given to cats suffering from conditions of decreased red blood cell production (i.e., renal failure, feline leukemia [FeLV], feline immunodeficiency virus [FIV] and aplastic anemia), hemolysis (i.e., immune-medicated, toxins and parasites), or blood loss (i.e., flea infestation, gastrointestinal bleeding, cancer and clotting disorders).

A transfusion reaction is caused by the immediate destruction of the transfused red blood cells by the patient's antibodies against the foreign blood type. It is manifested by such signs as urticaria, erythema, facial swelling and respiratory distress in the blood recipient. "It can be quite devastating if mismatch blood is given," explained Dr. Giger. "If matched blood is transfused, these red blood cells survive for weeks to 2½ months, whereas if the blood is not matched, they last a few hours to a few days and can cause life-threatening reactions."

Hence, the importance of blood typing or cross matching in transfusion medicine. Blood typing is a simple procedure that uses reagents to identify the type A and B blood sample. Blood compatibility can also be determined from a blood cross match, in which a sample of donor red blood cells is mixed with a sample of recipient plasma and vice-versa. To facilitate transfusions in cats, VHUP maintains a blood bank, with mostly type A, but also some B donors, and blood products such as packed red blood cells and fresh frozen plasma to allow for storage and specific therapy.

The second condition of blood incompatibility is hemolysis in the newborn, referred to as neonatal erythrolysis (NI). Cats receive antibodies from the colostrum and milk in the first 24 hours postpartum to protect them against infections. However, the colostral/milk anti-A antibodies from type B queens may attack red blood cells from a type A and AB kittens. In NI, the kitten's red blood cells are lysed by the incompatible colostral antibodies. Dr. Giger determined that "NI is a common cause of fading kitten syndrome and kitten mortality complex in certain purebred cats. Typically, affected kittens are born healthy, but begin to fade within minutes to hours after they start nursing. They may acutely die or develop very dark red brown urine from the lysed red blood cells. Kittens that survive this acute period become anemic and jaundiced by about day three and often develop tail tip necrosis."

NI causes considerable mortality in the first week of life, particularly in purebred catteries, where the incidence of type B blood is higher. A difficult condition to manage medically, NI is best prevented, said Dr. Giger. "Prevention is accomplished by typing cats before breeding them. If you have a B queen, it should only be bred to a B tom cat." You can get your cat blood typed at your veterinarian's clinic, by coming to VHUP or by sending a lavender top blood sample to the Josephine Deubler Genetic Testing Laboratory here at Penn (www.vet.upenn.edu/penngen, or penngen@vet.upenn.edu or (215) 898-3375).

Feline Hip Dysplasia— A Discussion with Emphasis on Maine Coon Cats

Although hip dysplasia is considered an affliction of the dog, new research shows that it occurs more commonly in cats than has previously been realized. Dr. Todd Murphy, resident in surgery at VHUP, described the pathophysiology of hip dysplasia and cited statistical data regarding the occurrence of this potentially debilitating condition in cats.

Hip dysplasia is characterized by incongruity of the coxofemoral joint (hip), manifest as a loose fit between its "ball" and "socket" components. The result of this abnormal loading is degenerative joint disease (DJD)—or osteoarthritis, pain and loss of joint function.

"Hip laxity in the cat, as in the dog, is the primary risk factor for the development of degenerative joint disease," said Dr. Murphy.

Two widely accepted screening methods exist for the detection of hip dysplasia in cats and dogs. The first, developed by the Orthopedic Foundation for Animals (OFA), dates back to the late 1960s. Using the OFA method, hip conformation is evaluated radiographically (using one radiographic view) by three different radiologists, and a subjective score produced based on a two out of three consensus. A newer diagnostic method, PennHIP®, was developed in the early 1980s. PennHIP

incorporates three different radiographic views—hip extended, hip compressed and hip distracted, subjective scores of degenerative disease, and an objective A"distraction index" (DI) measurement. The DI is an estimation of the risk for future development of DJD. A DI of 0.1, for example, is almost a guarantee that hip dysplasia will not develop.

Dogs not uncommonly show clinical signs of hip dysplasia, and many treatment options are available for them. Cats, however, are rarely clinical for, or diagnosed with, hip dysplasia. For those rare cats that are diagnosed with hip dysplasia, the treatment options are very limited. While ample research has been done on canine hip dysplasia, the research findings on hip dysplasia in cats are paltry. In fact, up until the early 1980s, only about six case reports of feline hip dysplasia existed.

Several studies on feline hip dysplasia recently have been conducted at VHUP. In one study, 140 Maine coon cats were evaluated over the last year-and-a-half. The average DI was a distressingly high 0.61. Some 45 percent of these cats were diagnosed with radiographic signs of hip dysplasia. Three cats showed clinical signs of hip dysplasia, such as reluctance to climb stairs or jump. Six cats had hip pain, and 11 cats had stifle pain or lameness. A cat with bad knees or hips is three times as likely to also have the other, said Dr. Murphy. This is yet another reason to try to reduce the occurrence of hip dysplasia.

"We think and hope that tight hips will lead to tighter knees," he said.

In another VHUP study, 78 domestic shorthaired cats were radiographically evaluated for the presence of hip dysplasia. The average DI was 0.42, which correlates with a relatively loose hip. Some 22 percent of the cats had radiographic DJD, one had hip pain and lameness, and two had patellar luxation.

In both dogs and cats, hip dysplasia is an inherited, polygenic, developmental condition, its clinical manifestation impacted by environmental factors. Earlier diagnosis of hip dysplasia can facilitate efforts to prevent breeding these cats and propagating this genetic trait, Dr. Murphy explained. "We need to make a better cat if we can."

Kitty Breath—An Update on Feline Dental Disease

Oral disease can lead to widespread organ changes in the cat, and is best combated with prevention. Dr. Colin Harvey, professor of surgery and dentistry at VHUP, explained the significance of the various types of oral diseases in cats, and talked about preventive measures.

In a recent study of 14,000 cats in the U.S., oral disease was found to be the most commonly diagnosed medical problem. The teeth, specifically, are often the genesis of the disease. "Dental diseases are major problems in cats," said Dr. Harvey.

Dental lesions in cats are comprised of either periodontal disease or feline odontoclastic resorptive lesions (FORLs). Periodontal disease takes the form of either gingivitis or the more serious periodontitis. Both begin with the deposition of plaque on the teeth. In the absence of abrasive forces, the plaque becomes mineralized by salivary secretions, which transform it into calculus (tartar).

Once calculus is present, Dr. Harvey explained, "it's much more difficult to cut off this cycle and go back to a clean tooth simply with a toothbrush—or a tasty mouse, in the case of a cat."

The anaerobic environment created by the plaque attracts bacteria that accumulate in the gingival pockets. Gingivitis—inflammation of the gingiva—is the result of the body's immune response to these bacteria. A condition that affects over 80 percent of mature cats, gingivitis is reversible once the plaque is removed.

The next step on the continuum of dental disease is periodontitis, which occurs in about half of cats aged four years or older. Characterized by the loss of attachment tissue connecting the gingiva and the bone supporting the teeth in the jaws, periodontitis is an irreversible condition.

When periodontal disease—either gingivitis or periodontitis—is present, bacteremia can result from heavy chewing, brushing or dental procedures. A positive association between severity of periodontal disease and likelihood of distant organ changes has been demonstrated in dogs and people. Similar studies have not yet been performed in cats.

Dental scaling-polishing and tooth extraction are the primary options for treating feline periodontal disease. Preventive measures include regular tooth brushing and use of chlorhexidine. The most effective antiplaque agent, chlorhexidine is available in rinses, gels and chews (i.e., CET Forte Chews). Two "dental diets" claim to retard the accumulation of plaque: Hills Feline t/d and Friskies Feline Dental Diet, both of which have been awarded the Seal of Acceptance of the Veterinary Oral Health Council.

FORLs, the second most prevalent feline oral condition, occur in about 50 percent of domestic cats aged four years or more. FORLS—or "neck lesions"—are "punched-out" areas on the surface of the tooth at or below the gingival margin. The prevalence of FORLs increases with the age of the cat, up until five or six years of age, after which affected teeth tend to fall out or are extracted.

A VHUP study found little correlation between FORLs and gingival redness, plaque or tartar. Although they create softened areas that "catch" the dental explorer, FORLS are best diagnosed radiographically. These lesions are quite painful, and best treated by simple extraction of affected teeth.

A fourth serious oral condition affecting cats is stomatitis, which is characterized by diffuse, fire-red inflammation and painful ulceration in the mouth. Stomatitis is the pathologic result of an overexuberant immune response to bacteria in the mouth. Although it may respond to antimicrobial and anti-inflammatory therapy, stomatitis is most effectively treated with extensive tooth extraction.

Viral diseases also lead to serious oral problems in cats. Both feline herpes and calici viruses cause oral signs, chiefly ulceration of the tongue, rendering eating and drinking quite painful. Two other viruses—feline leukemia virus (FeLV) and feline immunodeficiency virus (FIV)—cause immune deficiency, which can facilitate secondary infections of the mouth.

While these oral syndromes are well recognized in cats, said Dr. Harvey, research is ongoing to further delineate the prevalence and etiology of these potentially serious oral problems in cats, and to establish the most optimal treatments and preventive measures for them. *J.C.*