



Summer 2000

### Bellwether 47, Summer 2000

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# *Bellwether*

University of Pennsylvania

Summer 2000

**47**

## **State Awards \$18 Million Grant for New Teaching and Research Building**



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## From the Dean

We continue to be indebted to Governor Ridge and the Pennsylvania General Assembly for the extraordinary support they provided to the School's non-preferred



appropriation this year. We received an 7.8% increase from the Commonwealth for a total of \$34.7 million. This figure includes funds for general School operations, Common-

wealth Scholarships for Pennsylvania students, and \$1.7 million earmarked for two specific projects; infectious disease research at New Bolton Center and a linear accelerator to be installed in VHUP. Both initiatives are critical to the School's future.

For infectious disease research, we plan to build additional laboratory space attached to the Myrin Building, thereby expanding the overall research capacity of New Bolton Center. Acquisition of a linear accelerator will provide us with the capacity to do high energy radiation therapy on patients with cancer, particularly cancers in deep tissues of the body. This is a significant advance for the clinical oncology program and development of The Mari Lowe Center for Comparative Oncology. Presently, we have to refer animals that require high energy radiation therapy to facilities that are at least 100 miles away. This is a considerable challenge for many owners since treatment usually requires repeated exposure over a two to three week period.

Another development in progress at New Bolton Center is the construction of a new swine facility. The swine industry is growing in Pennsylvania and the School pledged to increase its capacity

for training students in swine medicine several years ago. Two faculty working in swine medicine were appointed and a small teaching herd was established in an old farrowing unit. The replacement unit provides students with the opportunity to become experienced at herd management, routine health care, nutrition, and the welfare of pigs.

In mid-July we celebrated Charlie Raker's 80th birthday with a party in Allam House. Charlie has been associated with the School since 1938 when he became a freshman student. He gave up his Norristown practice in 1950 to join the faculty. Charlie has made wonderful contributions to the School and to Veterinary Medicine and there were many who came to the birthday party to celebrate his great accomplishments. 🏡

Alan M. Kelly  
*The Gilbert S. Kahn*  
*Dean of Veterinary Medicine*

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## Papillon Captures Grand National

Quite a few people at the School had a keen interest in the Grand National, the famous steeplechase race at Aintree, near Liverpool, in Britain. The reason: Papillon, a horse owned by Mrs. Elizabeth Moran was competing. Dean Kelly even placed a bet on the horse.

Papillon did not disappoint Mrs. Moran or Dr. Kelly. The nine-year old gelding won this grueling race by a length and a quarter. He and his rider, Ruby Walsh, cleared all the high fences and obstacles on the 4.4 mile long course. The Grand National race is a hard one for horses and riders. This year, 39 horses started and 17 finished. The others disqualified along the way.

New Bolton Center benefitted mightily from this win as part of Papillon's purse was donated by Betty Moran for the Almira and Hardy Scott Sports Medicine Building. Now this horse too will have a plaque in a New Bolton building, like Mrs. Moran's Belmont and Ameri-



can Jockey Club Gold Cup winner, Creme Fraiche, whose winnings contributed to the nursing station at the Connelly Intensive Care Unit/Graham French Neonatal Section.

Mrs Moran is a well-known breeder of horses and her animals compete under the Brushwood Stable white and pink silks in flat races and steeple chase races on both sides of the Atlantic. She has bred and owned many winners.

Betty Moran is a good friend of New Bolton Center and the School. Some

years ago she established the Mark and Lila Allam Professorship of Surgery, she supported the Widener Hospital for Large Animals and its ICU and the Almira and Hardy Scott Sports Medicine Center. Each September Mrs. Moran hosts the reception and party at the American Gold Cup, a stadium jumping event benefitting the School's hospitals.

Dean Kelly too contributed his winnings to the Sports Medicine Building. 🏡

## State Awards \$18 Million Grant for new Teaching and Research Building

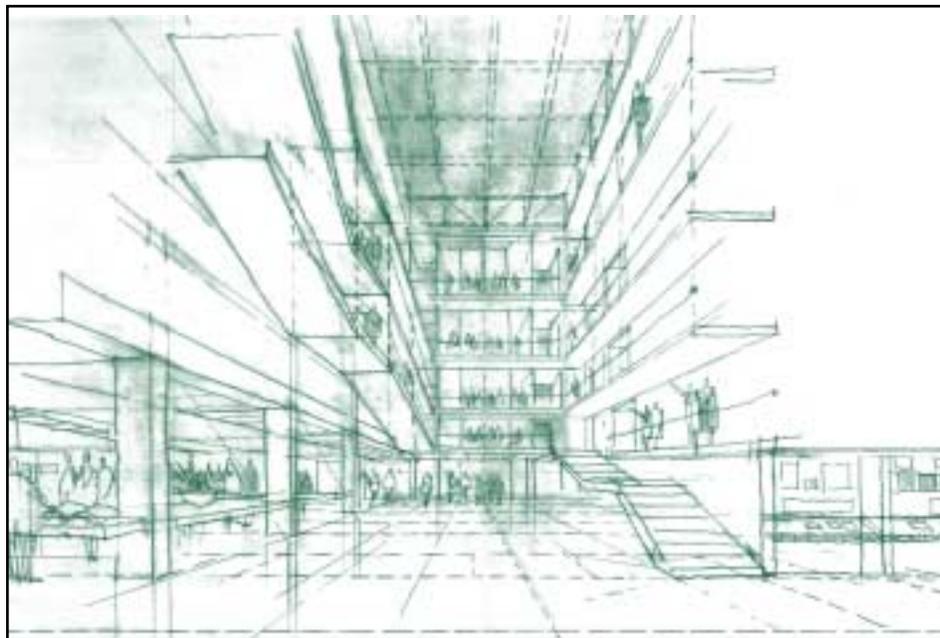
Pennsylvania Governor Tom Ridge announced that the School will receive \$18 million for the planned new Teaching and Research Building in Philadelphia. The grant, part of a historic agriculture capital investment by the Commonwealth, is a matching grant, requiring the School to raise an equal amount within five years.

“Recognized as one of the finest veterinary schools in the world, our commitment will allow Penn to build a state-of-the-art teaching and research complex to better serve the state’s agricultural needs,” Ridge said during the ceremony held on August 9 at the Farm Show Complex in Harrisburg.

The \$43 million Teaching and Research Building, to be located at 39th and Spruce Streets, will provide modern teaching, learning, and research spaces, replacing the antiquated facilities currently in use.

“We are grateful to the Commonwealth—to Governor Ridge and the state legislature—for making a grant that will enable us to begin construction of the new Teaching and Research Building,” said University President Judith Rodin during the ceremony.

“Governor Ridge recognizes the important role Penn’s School of Veterinary Medicine and its graduates play in maintaining the health, welfare and suc-



cess of the Commonwealth’s livestock, poultry and equine industries,” said Dean Alan Kelly. “We are profoundly grateful to the governor for his support for the new Teaching and Research Building and for so decisively advancing the School’s historic mission. We now have a lot of work to do to raise the balance so this building can become a reality quickly.”

The 100,000 ft<sup>2</sup> building will connect to the Rosenthal Building by an atrium; the new building’s footprint will cover the current library, a small grassy area, and a parking lot.

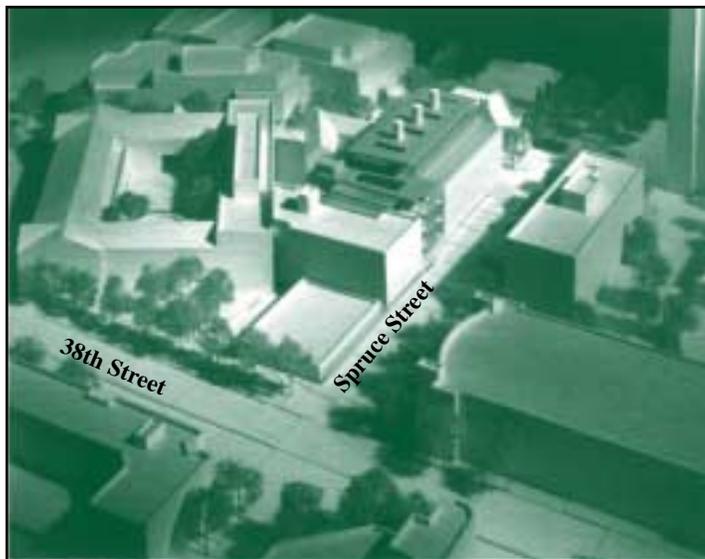
The first floor and a mezzanine area will accommodate two new lecture halls, equipped with the latest audio visual teaching aids. The expanded new library and the student computer area will enable students to take advantage of computer-based resources and com-

puter-aided teaching materials. A new student lounge will also be in this area as will be exhibition space.

Three floors will be devoted to Open Plan laboratory modules which will greatly enhance the School’s interdisciplinary research programs. These facilities will enable the School to attract and retain the new generation of research and clinical scientists who will train the veterinarians for the new century. Clinicians and basic scientists will work side by side and students will be exposed to ground-breaking research.

Among the areas of investigation in the new building will be infectious diseases, a major reemerging threat to animal and human health; animal transgenesis and germ cell research, an exciting biomedical research area that promises healthier and more productive food animals; comparative medical genetics, and comparative oncology.

The historic grant to the School is part of a \$90 million commitment to Pennsylvania agriculture; the other two projects are expansion and renovation of the Farm Show Complex in Harrisburg; and a new Department of Agriculture Livestock Evaluation Center in Centre County. 



## Unusual Case Leads to DNA Screening Test

VHUP's clinicians see many unusual cases. Sometimes patients have a disease that has not yet been described in a breed but occurs in other species. The task for the clinician then is to identify the disease and develop a treatment to help the patient. This is exciting but not easy. These cases usually are complex and can involve a lot of testing and consulting with specialists here and sometimes at other institutions. Frequently a breeder enters the picture, wanting to know whether the disease or condition is an inherited one and what can be done to prevent it.

A one-year old male miniature schnauzer came to VHUP's clinic in 1996 with complaints about difficulty swallowing, salivation, noisy breathing and a stiff gait; he was seen by the neurology service. During the examination Drs. Charles Vite and Francesca Cozzi noticed that the dog had enlarged skeletal muscles, a shortened lower jaw, dental abnormalities and a tongue that was large. The animal had difficulty rising from a sternal position and it took him a little while to stand properly and walk. He was stiff when he began to walk, and when asked to move at a faster pace, he bunny-hopped.

The clinicians suspected an abnormality in the skeletal muscles, a myopathy. To make a definitive diagnosis and to rule out other conditions such as myotonic myopathy, muscular dystrophy, myositis, or lysosomal storage disease, a number of tests were performed.

CBC and other blood tests were normal. Urine screening did not reveal any evidence of primary metabolic disease, and titers for antinuclear antibodies and Toxoplasma were negative. Radiographs, echocardiography and electrocardiography revealed no abnormalities. The next step was electrodiagnostic testing to measure the electric discharges in response to stimulation in the dog's muscles. Here abnormalities were found. Discharges, evoked by insertion of the recording needle, were not even, they waxed and waned and the frequency of amplitude gradually decreased and then ceased within 25 seconds. In normal

dogs, electrical activity is seen for less than a second following needle insertion.

The conduction velocity of the major motor nerves was also tested; these results were normal. The dog was anesthetized for the tests. A muscle biopsy was also performed. Some of the tissue was examined under a high power microscope and hypertrophic (enlarged) muscle cells were found.

Based on the tests, the clinicians made a diagnosis of myotonic myopathy. They suspected a biochemical defect as the cause of the abnormal muscle contractions. The dog was treated with oral



medication and he improved significantly. He could rise easily, breathe quietly, and eat and drink without trouble. His gait was less stiff and he could step onto a four-inch platform. He could not manage stairs. The patient was helped, but it was not the end of the case.

Dr. Vite investigated further. He had help from the breeder who provided information on the relatives of the affected dog. Pedigrees were furnished and information was given on other dogs with the same condition. Many of these animals and their healthy relatives were examined at VHUP. Dr. Vite consulted with members of the Section of Medical Genetics at the School, among them Drs. Melniczek, Patterson and Giger. Dental abnormalities were characterized by Dr. Margeurita Gracis of the Section of Dentistry. He also consulted with researchers at Penn's School of Medicine (Drs. Rich and Barchi), and Drs. Rhodes, Fahlke and George at Vanderbilt University Medical School because they had a strong interest in myotonias in humans.

During this time, he and Dr. Susan Volk studied the effect of procainamide in treating the disease in affected dogs.

The condition had only been reported in a strain of mice, the goat, the horse (identified by Dr. Sheldon Steinberg), the cat, the chow chow, as well other dog breeds. However, the cause of the disease in dogs had not been identified, and a good animal model for the study of the condition was lacking. The miniature schnauzer could serve as a model for other affected dogs, and studies could help in developing treatment for people who suffer from myotonia congenita.

Myotonia presents a significant medical problem in humans. Much research is devoted to understanding the cause and to finding treatment and a cure.

Drs. Vite, Cozzi, and Rich examined the muscle biopsy in vitro and studied the electrical properties of the muscle. These studies revealed abnormalities in chloride

ion conductance across the muscle membrane. They collected DNA samples from normal dogs and affected dogs. Because the gene sequence and location were known for the chloride channel in humans, researchers could focus on a particular area of the dog DNA. Collaborators at Vanderbilt University identified a genetic mutation that causes a defect in the chloride channels in the muscular membranes. This interferes with the transmission of electric impulses within the muscle and causes the abnormal actions of the muscles.

Members of the Section of Medical Genetics analyzed the pedigrees and concluded that the condition was inherited as an autosomal recessive trait. The group then focused on developing a DNA screening test that could be used to identify carrier animals. The collaborators at Vanderbilt had identified the gene, the mutation, location of the mutation, the actual mutation and they had developed the DNA test. The Josphine Deubler Genetic Disease Testing Laboratory in

the Section of Medical Genetics refined the test, which is capable of detecting affected dogs, carrier dogs, and “clear” dogs. In March of 2000 the DNA screening test for myotonia congenita in miniature schnauzers was ready. Since then numerous carriers have been detected

among the first 200 dogs tested. Breeders now have the tool to identify carrier animals which then can be dropped from the breeding pool. If everyone is diligent, the disease can be readily eliminated from the breed in a few generations.

The test for myotonia congenita in

miniature schnauzers is one of several tests for inherited diseases developed or refined by Penn’s Section of Medical Genetics and offered by the Josephine Deubler Genetic Disease Testing. These tests are not easy to develop, and frequently they are breed

*(continued on page 23)*

## *West Nile Virus Infection in Horses* By Jonathan Palmer, VMD, DACVIM

**W**est Nile Virus (WNV) primarily causes disease in birds and is usually spread by mosquitoes but it occasionally causes disease in horses. Horses become infected with WNV by the bite of a mosquito which previously (at least six to ten days earlier) fed on a bird infected with WNV. Infection does not always cause clinical disease in horses. In the recent outbreak of WNV on Long Island, NY, as many as a third of the horses on the outbreak farms may have been infected but only 14% developed disease. When horses have clinical signs, the disease can be very serious. Half of the clinically affected horses on Long Island died or were euthanized. This is the only outbreak of WNV in horses ever reported in North America, but the disease in horses has been frequently reported in Europe and Africa with similar results.

Horses with West Nile Fever can have a variety of clinical signs. They may have a mild flu-like syndrome with fever, depression, listlessness, and occasionally somnolence. When fever occurs it may be biphasic with the early fever associated with mild flu-like signs and a second fever a week later associated with the onset of more serious neurologic signs. Some cases will develop muscle fasciculations and an unusual muzzle twitching. They may show more serious neurologic signs including incoordination and ataxia (stumbling), circling, aimless wandering, head pressing, and hyperexcitability followed by convulsions, coma, and death. In some outbreaks a progressive hind limb paresis (incoordination, ataxia, stumbling) progressing to complete hind limb paralysis (inability to rise behind) and finally front leg involvement is reported as typical. Simultaneously, brain signs will be pro-

gressive (depression, somnolence or hyperexcitability, convulsions, coma). Death may occur within five to ten days of development of serious signs in half of the cases. The other half will recover with the most dramatic improvement within three weeks.

West Nile virus is primarily transmitted between birds by mosquitoes. Occasionally virus-carrying mosquitoes will bite mammals exposing them. The Veterinary Services section of APHIS, US Department of Agriculture, has concluded, based on experimental inoculations carried out on horses, that horses are not involved in the transmission cycle of WNV. That is, horses are terminal hosts because they do not maintain a sufficient viremia to infect mosquitoes or other mammals (see the USDA web site at <http://www.aphis.usda.gov/vs/ep/WNV/>). Previous studies in horses support this conclusion. This means, as stated by the Centers for Disease Control and Prevention, (see the CDC web site at [http://www.cdc.gov/ncidod/dvbid/arbor/West\\_Nile\\_QA.htm](http://www.cdc.gov/ncidod/dvbid/arbor/West_Nile_QA.htm)) that infected horses will not transmit WNV to other horses or to people. So an infected horse is not a threat to other horses in contact with it and people cannot contract West Nile Fever by caring for an infected horse. However, special care should be taken when handling blood, spinal fluid, or nervous tissue from suspect animals since these may contain virus.

The virus has not yet been identified in Pennsylvania or Delaware; however it has been found in birds in New York, Connecticut, New Jersey, and in one bird in Maryland (see USDA web site for a map). The virus is introduced into an area through infected birds. In the outbreak last fall, some infected birds developed neurologic signs such as ataxia

(loss of coordination), tremors, abnormal head posture, circling, and convulsions followed by death. The appearance of dead birds in an area may be an early warning that the virus is present. When handling dead birds that may have died from WNV infection, care should be taken. There is no evidence that people can catch this disease from dead birds, but the Center for Disease Control and Prevention recommends that no one should ever touch any dead animal barehanded. Call your local health department for proper procedures for handling of dead birds.

How can horses be protected from WNV infection if the virus enters the area? The key is mosquito control to stop the bird-mosquito infection cycle. The primary mosquito vector is *Culex spp.* This mosquito spends its entire life within a range of about 1000 yards. Thus local control can be very effective in stopping WNV transmission. The most effective method of mosquito control is to destroy the mosquito larval habitat. *Culex* mosquitoes can breed in any puddle that lasts more than four days. So it is important to reduce the amount of standing water available for breeding such as water troughs (should be cleaned at least once or twice a week), water buckets not in use, plastic wading pools, bird baths, wheelbarrows, clogged roof gutters, discarded tires, tin cans, plastic containers, ceramic pots, or any water-holding container. Although less effective than preventing mosquito breeding, efforts to limit the horse’s exposure to adult mosquitoes can also be attempted. Horses should be stabled inside during peak mosquito feeding times which are dusk and dawn. Also, insect repellent approved for horses can be used (always follow label instructions). 



**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*

**K**idney 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; pre-operative 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*

**F**eline 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***

**B**lood 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 benefited 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.*

*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*



*Mrs. Young, Dean Kelly, Mrs. Clark.*



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, Birmanians 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-mediated, 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 dis-

stress 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 colostrum/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 colostrum 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 con-

dition 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/pennngen](http://www.vet.upenn.edu/pennngen), or [pennngen@vet.upenn.edu](mailto:pennngen@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”distractraction 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 anti-plaque 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.*



**Penn's 30th Canine Symposium on January 29, 2000 was sold out. The theme, Canine Reproduction, generated a great deal of interest and we had to turn a number of people away. Following are summaries of the presentations.**

## Reproductive Problems in Female Dogs

Apparent infertility in the bitch may actually be a manifestation of underlying problems. Dr. Margret Casal, assistant professor of medical genetics at the School, discussed reproductive problems in the bitch that impair fertility or otherwise hamper successful matings.

The number one reason for matings to be unsuccessful is that the bitch was bred on the wrong day of her cycle. On the other hand, some bitches fail to get pregnant because they are altogether acyclic. Acyclic bitches either have not experienced their first heat for reasons like delayed puberty or breed idiosyncracies (large-breed dogs, for example, tend to begin cycling at a later age than do small-breed dogs), or they have ceased their heat cycles due to disease such as ovarian cysts or tumors.

Other disturbances in the heat cycle can occur, said Dr. Casal. These include prolonged proestrus, prolonged estrus and split estrus. Bitches in prolonged proestrus often must be "pushed into ovulating" using hormone therapy. Prolonged estrus phases—which last more than 12 days—are sometimes anovulatory. Hormone therapy to treat prolonged estrus may result in marked side effects. Split estrus is characterized by a normal proestrus and the beginning of an apparently normal estrus in which the female initially allows mounting, then refuses, and then allows it again. Vaginal cytology often reveals that the bitch was not in true estrus until the second standing heat. These cycle anomalies cause difficulty in timing breeding.

Infections can also lead to the appear-

ance of infertility in the bitch or the stud dog. Infections with *Brucella canis* or canine herpesvirus can cause early abortions. These aborted pregnancies, which often go unnoticed, may be mistaken for barren cycles. *Mycoplasma* has also been implicated as a cause for infertility. *E. coli*, *Staphylococcus* and *Streptococcus* are often associated with pyometra, another cause for infertility. Most bacterial infections are diagnosed by culturing vaginal secretions; a diagnosis of brucellosis or herpes infection is made by blood culture and/or by lymph node biopsies.

Other frequent medical barriers to reproduction in dogs include hypothyroidism, obesity, malnutrition and congenital defects. Vaginal hyperplasia and malformations may lead to reluctance to be bred, which gives the semblance of infertility. Abnormalities of sexual differentiation—in either chromosomal sex, gonadal sex and phenotypic sex—may also impair fertility. Many of these are breed related, such as pseudohermaphroditism in the miniature schnauzer.

## Reproductive Problems in Male Dogs

Male infertility typically stems from primary defects in the sperm cells, which can result from a number of disease processes. Dr. Cynthia Ward, assistant professor of medicine at the School, reviewed semen evaluation procedures in dogs and discussed diseases of the prostate that can impair fertility.

"All infertility exams should involve semen collection and evaluation," said Dr. Ward.

Semen samples can readily be obtained from experienced stud dogs. Three semen fractions are present: clear pre-sperm fluid, sperm-rich fluid, and prostatic secretions. The sperm-rich fraction should be evaluated for sperm count, motility, morphology and cytology. Sperm motility should be examined promptly, as it decreases as the semen cools. The percentage of sperm swimming rapidly forward should be estimat-

ed from at least four different places on the slide, and the presence of sperm agglutination—which is associated with such causes of infertility as *Brucella* and anti-sperm antibody—noted. Normal dogs should have at least 200 million sperm per ejaculate. If consistently poor sperm motility is observed, infectious and/or inflammatory causes should be considered.

Sperm morphology is evaluated under staining. Generally, at least 75 percent of the sperm cells should be morphologically normal. The presence of white blood cells—especially degenerated ones, or red blood cells, may signal infection and/or inflammation. If infection is suspected, a semen sample should be cultured for aerobic bacteria.

The third semen fraction, which consists mainly of prostatic secretions, should be examined cytologically, said Dr. Ward. The presence of large numbers of bacteria, or red/white blood cells, may signal infection and/or inflammation.

"I and others believe there's a lot of subclinical infertility caused by chronic prostatic disease," she explained. "Maybe we should be looking at the prostate more and more carefully when we're trying to diagnose some types of infertility in male dogs."

Prostatitis and prostatic abscesses can cause infertility in dogs. Both conditions are infectious in etiology. *E. coli* is the most common organism isolated, although others, such as *Brucella canis*, have also been found. Approximately ten percent of affected dogs have concurrent urinary tract infections. A dog with acute prostatitis is often systemically ill. A stilted gait, caudal abdominal pain and urethral discharge may be present. Ejaculation is painful, and these dogs may be reluctant to breed. Prostatic infection may spread hematogenously to other organs and, in chronic cases, may also cause infertility because sperm do not thrive in the presence of inflammatory mediators. Diagnosis is made by hematology, urinalysis, urine culture, or culture and cytology of semen or prostatic fluid. Prostatic infections are treated with antibiotics for four to six weeks, and cas-



tration is indicated in refractory cases.

Another common prostatic disease is benign prostatic hyperplasia (BPH), an age-related change occurring in people and dogs. BPH is a benign increase in the number and size of prostatic epithelial cells. Although BPH occurs in every aging dog, they don't all manifest the clinical signs of urethral discharge, hematuria, and tenesmus. BPH is diagnosed by clinical signs, physical exam, radiographs or ultrasound, hematology, urinalysis and prostatic fluid analysis. Castration is the treatment of choice for BPH, although the drug finasteride, an androgen antagonist, can be used to help decrease the proliferation of prostatic cells.

A far more serious affliction than BPH, prostatic neoplasia accounts for about five percent of all prostatic diseases. Occurring with equal frequency in intact and neutered males, prostatic neoplasia most commonly takes the form of adenocarcinoma, followed by transitional cell carcinoma. Prostatic neoplasia carry grave prognoses.

## Advantages and Disadvantages of Using Fresh-Chilled or Frozen Semen

Creating the "choice" pup today is possible without ever having the "choice" parents in each other's presence. Dr. Melissa Goodman, a reproduction specialist who maintains a specialty veterinary practice at the Veterinary Referral Center in Frazer, Pennsylvania, presented the pros and cons of remote reproduction via frozen or chilled semen shipments.

By employing sophisticated technology available for obtaining, processing and using chilled or frozen semen, one can greatly increase the gene pool available for matings. These reproductive methods also enable breeders and owners to achieve pregnancies without shipping the bitch or stud dog or hosting the bitch. Yet the added convenience and versatility of these technologies comes with tradeoffs, explained Dr. Goodman.

While the use of chilled semen eliminates limitations of geography, it introduces limitations of time: Although semen extenders provide the cells with a nutrient source and protection during transport, the life span of the sperm is greatly reduced, necessitating that the stud be available at the time the bitch is ovulating.

Furthermore, said Dr. Goodman, "Whenever we process sperm—chilling, shipping, freezing and thawing—we are damaging it. So, by definition, we will always decrease fertility whenever we use these procedures."

To obtain a high-quality ejaculate, the semen collection process must be performed with care and foresight. Since, at best, ten percent of the ejaculate is lost during collection, processing and shipping, Dr. Goodman recommends that only dogs with normal ejaculates (normal sperm count and motility) be used. The quantity and quality of semen produced in an ejaculate are affected by the dog's age, size, breed and general health status. Some medications and recent ejaculation may also affect semen quality. A period of sexual rest of 10-14 days is suggested before ejaculation to maximize the sperm count. Libido, which also affects the quality of the ejaculate, can be heightened by an experienced collector and the presence of a teaser bitch.

Following collection, the ejaculate—which contains three fractions—should be separated, and only the sperm-rich fraction used.

The use of *chilled* semen requires skillful choreography. Because the sperm begins to degrade immediately after ejaculation, insemination should be performed within 24 hours of collection. Therefore, the schedules of the stud owner, bitch owner, collecting veterinarian and inseminating veterinarian must be coordinated, and shipping arrangements must be made in advance.

Accurate ovulation timing is crucial to the success of chilled semen breeding. The stress of chilling and shipping reduces the life span of the sperm cells from about 5-7 days to just 2-4 days. Inseminations must be performed during the bitch's 72-hour fertile period. The most accurate indicator of ovulation and

the fertile period is the luteinizing hormone (LH) surge, which is best identified by a combination of blood assays for LH and progesterone, as well as vaginal cytology and vaginoscopy. Dr. Goodman advocates two inseminations, usually on days four and six post-LH surge. The average conception rate for chilled, extended semen is approximately 80 percent.

Unlike chilled semen, frozen semen allows the genetic potential of a stud dog to be preserved for future use, in the event of disease, death, unexpected sterility or sale of the dog. Freezing the semen also facilitates long-distance and international breedings, and is useful when the stud is not available during the bitch's fertile periods. When properly processed, frozen, and stored, canine semen will last an estimated 10,000+ years. The sample is extended with a buffer solution that protects the sperm cells during freezing and thawing. The sample is then frozen either in straws over liquid nitrogen or in pellets in dry ice. Storage is done in liquid nitrogen.

For an insemination using frozen semen, only a bitch with good fertility should be used, since the sperm quality will be compromised. Approximately 100 million progressively motile sperm are needed in order to achieve a normal pregnancy. Therefore, post-thaw sperm count and quality should be assessed in order to determine the number of straws to use.

Precise ovulation timing is essential, since the stress of freezing and thawing damages the sperm membranes, shortening the life span of the thawed sperm cells to 12-24 hours. Daily blood testing is recommended to identify the LH surge, enabling insemination during the bitch's short fertile period. If a frozen insemination is performed even a few hours too early, said Dr. Goodman, "you can have high-quality frozen semen and a very fertile bitch, but the two will pass like ships in the night."

Once thawed, the semen can be deposited into the uterus via a catheter passed through the cervix. The most common, and perhaps most successful, method, is a quick surgical technique that allows direct deposition of the



semen at the ends of the uterine horns, just adjacent to the oviducts.

## Managing the Breeding

Most dogs that fail to conceive have normal fertility status. Dr. Matthew Ellinwood, resident in medical genetics at the School, revealed the real reason behind unsuccessful matings and outlined steps for enhancing breeding success.

In cases of apparent infertility, the matings have not been accurately synchronized with ovulation. “The biggest problem is not the dogs having a primary infertility,” said Dr. Ellinwood. “It’s that they haven’t been managed properly.”

Planning successful breedings requires a good understanding of the estrus cycle. The bitch experiences her first estrus between six and 18 months of age, with size and breed variations. The estrus cycle is divided into four phases that are differentiated by cytologic, hormonal and behavioral features.

The first phase, proestrus, is characterized by bloody vaginal discharge. During proestrus—which lasts one week, on average—estrogen becomes the dominant hormone, the uterine lining begins to proliferate, and the vaginal epithelium starts to cornify. The next phase, estrus, spans from the point at which the bitch willingly stands for mating to the point at which she refuses to be bred. Estrogen levels fall and progesterone rises, the vaginal epithelium further cornifies, and ovulation occurs. During estrus, which lasts about a week, the bitch experiences behavioral changes that culminate in “standing heat,” or submission to breeding. Diestrus follows, lasting 57 days in the pregnant bitch and slightly longer in the nonpregnant bitch. During diestrus, the bitch refuses to be bred. Progesterone dominates and the vaginal cytology changes to less than 50 percent cornified cells. Ensuing anestrus—which lasts five months, on average—is the period from the end of the progesterone elevation to the beginning of the next cycle.

In preparing for breeding, one should have physical exams—including repro-

ductive exams—performed on both the bitch and the stud dog. Routine lab work, including a complete blood count, a serum biochemistry panel and a urinalysis, should be done on the breeding pair, particularly the bitch. A *Brucella canis* titer should be obtained on both dogs. And if either dog has a history of infertility, vaginal and preputial cultures should be performed.

Accurate timing of breeding is perhaps the greatest breeding success factor. In order to detect proestrus, the bitch’s vulva should be examined once weekly beginning four-and-a-half months after the beginning of her last cycle. After the bitch has begun to show vaginal discharge, signaling proestrus, vaginal cytology should be done every three to four days until she has 90 percent cornified cells (estrus). Once the bitch has reached standing estrus, breeding should be allowed every two days for two to three breedings. After this, breeding frequency can be decreased to once every three or four days until the bitch refuses to be mounted.

While the behavior of the bitch and, in some cases, the stud are reliable indicators of estrus, a bitch will occasionally refuse to stand for breeding during estrus under any circumstances. In such cases, artificial insemination should be considered.

In conclusion, Dr. Ellinwood recommended that owners and breeders keep thorough records of previous cycles in order to better predict breeding variables and plan matings. In timing breeding, these records should be considered in tandem with vaginal cytology and behavioral cues in the bitch and the stud.

## Whelping the Litter

The complexity of the birthing process is manifest in the post-whelping period, during which a variety of complications may arise in the dam. Dr. Margaret Casal, assistant professor of medical genetics at the School, discussed these disorders and their clinical signs, diagnosis and treatment.

Following whelping, uterine involution is complete four weeks postpartum, but the uterus does not return to its

anestrus histologic state until about 150 days postpartum. A bloody discharge is passed for up to 10 days to two weeks after whelping.

Persistent heavy bleeding after whelping may indicate rupture of the blood vessels within the uterus or the birth canal. The most common reasons for uterine bleeding are overdoses of oxytocin and fetal extraction using surgical instruments. Purely vaginal bloody discharge is typically caused by trauma to the birth canal. Hemorrhage, which usually begins several days after birth, usually occurs in the morning when the bitch arises. Bleeding from damaged vessels in the birth canal can be controlled with tamponage or, in the case of larger vessels, surgical repair. Uterine hemorrhage is usually controlled with pregnancy hormones. If blood loss is extensive, transfusion may be necessary.

Metritis—inflammation of the uterus—may also occur postpartum. Metritis is the result of bacterial invasion into the uterus secondary to abortion, fetal infection, manipulation during whelping, placental retention or ascending infection. Bitches with metritis typically neglect their pups. Diagnosis is made by ultrasound and vaginal smears. If not treated promptly, metritis can lead to more serious conditions, such as pyometra and sepsis. Treatment includes antibiotics, oxytocin and prostaglandins.

In a bitch with retained placenta, the discharge may also contain necrotic particles. Clinical signs are fever and persistent greenish-black, watery, foul-smelling discharge. Diagnosis is made by digital palpation, vaginoscopy or ultrasound. Placental retention is treated with oxytocin and prostaglandins.

Uterine prolapse—protrusion of parts or all of the uterus through the vulva, occurs typically after the birth of the last pup. Rapid repositioning of the uterus is critical to preventing tissue necrosis, an indication for immediate spaying.

Subinvolution of placental sites (SIPS), a condition wherein the sites of placental attachment do not revert to their normal, nonpregnant state, occurs occasionally in bitches younger than 2.5 years of age. Affected bitches present

*(continued on page 16)*

Family and friends filled the Zellerbach Theatre at the Annenberg Center on May 22 for the 115th Commencement Exercises of the School. Cameras clicked and families cheered as 99 graduates and members of the faculty marched in and took their places on the stage. The Class of 2000 was composed of 78 women and 21 men. This brings the total of Penn veterinary graduates to 1,683 women and 3,943 men.

Dean Kelly opened the ceremony and he was followed by Christine Connelly, chair, the School's Board of Overseers. The commencement address was given by Dr. Arthur L. Kaplan, director of the University's Center for Bioethics.

During the presentation of the diplomas and the hooding, Dr. Kelly was

assisted by Dr. James B. Lok, Dean's Awardee for Leadership in Basic Science Education, Dr. Dorothy Brown, Dean's Awardee for Leadership in Clinical Science Education, and Associate Dean Dr. Charles Newton.

Veterinary Medical Alumni Society President Dr. Robert W. Stewart, V'68, presented the class flag to Class President Omar Farias-Llovet. Dr. Dean Richardson, 2000 Carl J. Norden Distinguished Teacher Awardee, assisted with the awarding of prizes and Dr. Jeffrey A. Wortman, V'69, associate dean for curricular affairs, assisted with the recognition of honor graduates. The official part of the proceedings came to a close after PVMA President Lawrence J. Gerson, V'75, administered the Veterinarian's Oath to the newly minted VMDs.



## Class of 2000

Leslie Carter Agulnick \*\*  
 Tracy Beth Akner  
 Samantha Lynn Asikainen  
 Elizabeth Branscomb Bales  
 Laney Jean Baris \*  
 Gillian Lee Beamer  
 Annette Belovi  
 Linda Marie Bender  
 Heather Aimee Berst  
 Benjamin Marc Brainard  
 Jason William Brooks \*\*\*  
 Jennifer Kay Buchholz \*\*\*  
 Catherine Elizabeth Buck  
 Christine Michele Burhans-Scruggs  
 Gabor Rocco Capodanno \*  
 Heather Elizabeth Chalfant \*\*\*  
 Sonja Tsung-Ying Chou  
 Monica Carrie Clare \*\*  
 Mary-Margaret Rachel Clements  
 Lisa Rose Cote  
 Shawn Matthew Day  
 Jamison DeSantis  
 Joan Diebold \*  
 Claudia Page Dwyer  
 Jennifer Whitcomb Elliot  
 Michael Joseph Engler  
 Omar Farias-Llovet  
 Allison Jane Felley  
 Dana Danette Fite  
 Dawn Catherine Fitzhugh  
 Michael Joseph Fullmer  
 Teresa Vanderlaan Garofalo  
 Curtis Henry Geary  
 Athan Vasilios Gerovasilou

Sarah Morrill Gladstone  
 Kirsten Brenda Glass \*  
 Jennifer Allison Granite  
 Cheryl Marie Gross  
 Tracey Anne Hall  
 Caroline Breneman Hallman  
 Troy Matthew Hallman  
 Jennifer Saylor Hamlet  
 Kimberly Beth Hammer  
 John Davidson Hershey  
 Anne Elizabeth Hessinger  
 Julie Mae Hoberman  
 Amy Holford  
 Jennifer Ann Hopkinson  
 Hillary Rachel Gorman Israeli  
 Krista Sue Kasprenski \*  
 Elizabeth Louise Knighton  
 Deborah Lynn Landis  
 Scott Lewis  
 Erika Kirsten Lilja  
 Lise Marie Lund  
 Kimberly Sharon Chee-Len Mah  
 Kristin Ann Mahoney  
 Janna Makovoz  
 Susana Martinez-Walter  
 Michelle Stacey Mayers  
 April Dawn McCord  
 Blaire Lynn Michael  
 Kelli Lynn Monahan  
 Heidi Kay Moore  
 Anita Pratt Morris \*\*  
 Margaret Childs Mudge \*  
 Jaime Alexandra Napolitano  
 Alisa Linn Newton \*\*\*

Sabrina Nicole Nye  
 Lisa Marie Olver \*  
 Diane Elizabeth Overlay \*\*  
 Sherry Ann Podhayny  
 Tammy Lynn Rakowski  
 Jeanette Rilling  
 Susan Stavros Rourke  
 Jack Denver Runk  
 Marcela Salas  
 Jodie Ann Elizabeth Santore  
 Elena Sawickij  
 Sean Douglas Sawyer  
 Kenneth Robert Schwartz  
 Lisa Jean Shientag  
 Howard Lawrence Silberman  
 Lara Joan Slusarz  
 Stephanie Eileen Snyder  
 Caroline Michelle Soter \*\*  
 Perri Stark  
 Tripp Morgan Stewart  
 Elvira Minge Tate \*  
 Tanya Thies  
 Donna Marie Trent-Burchess  
 Tara Krystal Trotman \*\*\*  
 Dana Lee Walck  
 Jennifer Jane Wandell  
 Michael Robert Watts  
 Kelli Elaine Weaver  
 Jacob Robert Werner  
 Staci Phillips Wiemelt  
 Edwin Alberto Zayas-Cruz  
 \*\*\**Summa Cum Laude*  
 \*\**Magna Cum Laude*  
 \**Cum Laude*



## *Award Recipients*

### **Leonard Pearson Prize**

Jacob Robert Werner

### **J.B. Lippincott Prize**

Jennifer Kay Buchholz

### **1930 Class Prize in Surgery**

Heather Elizabeth Chalfant

### **Auxiliary to the American Veterinary Medical Association Prize**

Benjamin Marc Brainard

### **Auxiliary to the Pennsylvania Veterinary Medical Association Prize—Small Animal Award**

Elvira Minge Tate

### **Auxiliary to the Pennsylvania Veterinary Medical Association Prize—Large Animal Award**

Lara Joan Slusarz

### **1956 Class Medal for Achievement in Pathology**

Tara Krystal Trotman

### **James Hazlitt Jones Prize in Biochemistry**

Joan Diebold

### **American Animal Hospital Association Award**

Sean Douglas Sawyer

### **Merck Awards**

#### *Small Animal Award*

Gabor Rocco Capodanno

#### *Large Animal Award*

Teresa Vanderlaan Garofalo

### **George M. Palmer Prize**

April Dawn McCord

### **Everingham Prize for Cardiology**

Gabor Rocco Capodanno

### **Large Animal Surgery Prize**

Jennifer Kay Buchholz

### **Large Animal Medicine Prize**

Kirsten Brenda Glass

### **Morris L. Ziskind Prize in Food Animal Medicine**

Scott Lewis

### **Morris L. Ziskind Prize in Public Health**

Monica Carrie Clare

### **Hill's Award**

Blaire Lynn Michael

### **Pharmacia & Upjohn Awards**

#### *Small Animal Award*

Caroline Michelle Sorter

#### *Large Animal Award*

Jennifer Kay Buchholz

### **Faculty/SCAVMA Prize**

Alisa Linn Newton

### **American College of Veterinary Surgeons Prizes**

#### *Small Animal Surgery Prize*

Tara Krystal Trotman

#### *Large Animal Surgery Prize*

Kirsten Brenda Glass

### **American Association of Feline Practitioners Award**

Jennifer Ann Hopkinson

### **Field Service Prize**

Jacob Robert Werner

### **Phi Zeta Award**

Diane Elizabeth Overley

### **Anatomy Prize**

Tara Krystal Trotman

### **American College of Veterinary Radiology Award**

Marcela Salas

### **Iams/VECCS Award for Excellence in Veterinary Emergency and Critical Care**

Benjamin Marc Brainard

### **Charles F. Reid Sports Medicine and Imaging Award**

Heather Aimee Berst

### **Lynn Sammons Food Animal Award**

Jason William Brooks

### **VetSmart Human/Pet Bond Award**

Hillary Rachel Gorman Israeli



(continued from page 13)

with persistent, serosanguinous, odorless vaginal discharge. Diagnosis is made by ultrasound. Subinvolution sites normally heal on their own; however, if necrosis becomes severe, the uterus can rupture, requiring immediate surgery.

A common finding in bitches producing copious amounts of milk, eclampsia ensues when heavy lactation depletes the bitch's calcium reserve. Eclampsia is seen at the height of lactation (2-3 weeks after whelping), and occurs more commonly in small- than large-breed dogs. Clinical signs include restlessness, muscle tremors, increased respiratory rate and, eventually, stiff gait, high fever (>104F) and convulsions. Therapy consists of intravenous calcium and if needed sodium bicarbonate and glucose. Following initial treatment, the bitch is sent home with calcium and vitamin D3 to prevent further occurrences.

Mastitis is a condition in which one or more mammary gland are enlarged, hot and red due to bacterial invasion by *E. coli*, *Staphylococcus* or *Streptococcus*. The affected bitch is typically febrile, anorexic and neglects her pups. The milk may be rancid. Pups should be prevented from suckling on affected teats. Abscesses are drained and adjunct treatment consists of antibiotics and warm compresses. Severe mastitis may warrant surgical removal of affected glands.

Occasionally, milk may not be expressed from the bitch's mammary gland. To test if she is not "letting down" the milk or if she is actually not producing any (agalactia) a single dose of oxytocin on the tongue will cause letdown if milk is being produced. Absence of milk production is an untreatable condition, and pups will need to be provided an alternate source of nutrition.

Chronism, or postpartum hysteria, is a breed-specific condition in which the bitch mutilates her normal pups. Occasionally, chronism is manifest as excessive grooming of the pups, abrading the skin off of them.

## Stillborn and Fading Puppies: What Can They Tell Us?

For owner and breeder alike, a dead pup is a heartbreak. But it is also a medical opportunity. The information veterinarians can glean from a pup that has died in utero or neonatally is paramount to preventing illness and reducing the likelihood of congenital defects in future generations.

"If you have a large litter and several of the pups die, you want them treated as a litter. Therefore, the health of that litter is dependent upon knowing what went wrong with the animals that haven't survived," said Dr. Mark Haskins, professor of pathology at the School, who lectured on neonatal and pediatric pathology in dogs.

The importance of the autopsy in this age group is underscored by the statistics: among purebred dogs, ten percent are stillborn or die before their first veterinary examination and nearly 20 percent die within the first week of life. Overall pre-weaning mortality is 30 to 45 percent.

If a pup dies abruptly, the two major concerns are infection and genetic defects. The former puts the surviving litter mates at risk; the latter, future generations. Autopsy data can be used to protect these two groups of pups, although pathology is not a perfect science. The clinical signs of "fading puppy syndrome," a term that describes a variety of conditions in which pups that are apparently normal at birth gradually weaken and die, are very nonspecific. Many of these pups suffer inborn errors of metabolism, which are difficult to diagnose, explained Dr. Haskins.

"The majority of the time, they're going to come back to you and say, 'I don't know why the puppy died.'"

The autopsy of the pup differs in many ways from that of the adult dog. In the pup, the skeletal muscle is comparatively paler in color, and adipose tissue is light brown and relatively sparse. The thymus, which regresses with age, is still prominent. Ossification is limited, and

the brain and kidneys are still in the process of maturation.

Such differences are taken into account when detecting for the presence of developmental malformations, which are a major concern in neonatal pathology. Malformations have been reported in seven to 20 percent of neonatal deaths in dogs and cats. Congenital malformations take many different forms, from duplications to arrested development (aplasia or hypoplasia), failure to regress (imperforation), and failure to close (persistent patency)—as in the case of cleft palate, diaphragmatic hernia and neural tube defects.

At the molecular level, developmental malformations are caused by alterations in DNA structure and nucleic acid function, altered energy states, changed membranes and enzyme inhibition. The most sensitive period for the occurrence of these anomalies is the first trimester (days 1-20)—the period of organ formation. The underlying causes for these molecular alterations are biological agents (i.e., viruses, bacteria and fungi), physical agents (i.e., ionizing radiation), chemical agents (i.e., certain drugs) and inherited genetic defects.

Less significant in dogs than developmental malformations, prematurity is manifest primarily as immaturity of the mature surfactant system that facilitates expansion of the lungs. Prematurity is a diagnostic challenge in dogs because of the great variation in size between breeds.

Mortality in neonatal pups can also be directly caused by infectious agents, such as herpesvirus, parvovirus, adenovirus (infectious canine hepatitis), paramyxovirus (canine distemper), bacterial infections (group B *Streptococcus* and *E. coli*) and trauma.

## Neonatal and Pediatric Care

Neonates require special care during their precarious first weeks of life. Dr. John Melniczek, lecturer in medical genetics at the School, discussed early postnatal development and care in pups.

The most stressful period in a pup's



life is the first week of age, which is the interval of highest mortality; weaning is the second most stressful time. The breeder can help a pup cope with stressors by examining it shortly after birth to detect for the presence of any obvious congenital defects, which may impair development and hinder survival. Some of the more common congenital abnormalities in pups are cleft palate, open anterior fontanel, hydrocephalus, heart disease, umbilical hernia and inborn errors of metabolism.

Within hours after birth, the pup should begin to consume colostrum, which is the source for over 90 percent of the maternal antibodies the pup receives. Prior to breeding, the bitch should have been brought up to date on her vaccinations, thereby maximizing the presence of maternal antibodies in her colostrum.

Because of their immature glucose storage systems and renal function, pups are prone to hypoglycemia and dehydration. Hence, adequate nutrition is critically important. The pup's growth rate is a sensitive indicator of nutritional status. Pups should be weighed daily for the first three weeks of life, during which time it gains about ten percent of its body weight daily. If weight gain is inadequate, the dam's mammary glands should be expressed to ensure adequate milk production, and her nursing behavior should be observed. Supplementation with milk replacers and bitches' milk should be considered in cases of poor weight gain. In nursing pups, weaning can begin at three to four weeks of age, but should not be completed until six weeks.

Neonates also have undeveloped thermoregulatory systems. Because of their large surface area-to-body mass ratio, sparse body fat, high water composition, poor blood flow to the extremities, and immature shivering and panting responses, pups have difficulty regulating their body temperatures. During the first weeks of life, the ambient temperature in the nesting area should be kept at 86-90F, with gradual reductions to 75F over the next three weeks. Maintaining normal body temperature—which is 96-97F during the first two weeks of life, and

increases to 100F by four weeks of age—is important for normal function of the pup's metabolic pathways. Normal body temperature is also a deterrent to infectious diseases, many of which grow best at low body temperatures.

Neonates can fall prey to a variety of infectious agents. Canine herpesvirus, most common in pups under three weeks of age, can cause depression, diarrhea, respiratory disease and sudden death. If contracted during pregnancy, it can cause abortion. Affected pups should be kept warm and well hydrated, and any electrolyte imbalances should be corrected. Although no vaccine is available, an affected dam's subsequent litters are usually immune if they've received adequate colostrum.

Canine parvovirus type 1, seen primarily in pups aged 5-21 days, causes diarrhea, pneumonia and death, as well as abortion and infertility in infected bitches. Like canine herpesvirus, treatment is symptomatic and no vaccine is available.

Pups of all ages are subject to bacterial infections. "The young animal is prone to these because the immune system is not yet what it should be," said Dr. Melniczek. Pups can develop bacterial respiratory infections through aspiration secondary to cleft palate, vomiting or

regurgitation. Kennel cough, caused by *Bordetella bronchiseptica*, is also frequently seen in neonates. Puppy pyoderma, usually caused by *Staphylococcus*, is a common skin affliction in pups.

Vomiting and diarrhea is often seen in pups aged three to five weeks. Usual etiologies in the pup are parasites (roundworms and hookworms), *Coccidia*, *Campylobacter*, *Clostridia*, *Salmonella*, distemper, metabolic disease (i.e., liver shunt) and dietary indiscretion.

Genetic diseases cause a variety of syndromes in pups, such as cystinuria in the Newfoundland, copper toxicosis in the Bedlington terrier and phosphofructokinase deficiency in the English springer spaniel. Sensitive metabolic screens and genetic tests for the identification of affected and carrier animals have been developed at the School. *J.C.*

January 27, 2000  
**31st Canine Symposium**  
VHUP, Philadelphia

March 24, 2001  
**24th Feline Symposium**  
VHUP, Philadelphia

## ***Bookmark This!***

<http://www.vet.upenn.edu/sace/penn-conference.html>

The Office of Continuing Education announces its new web site devoted entirely to the **2001 Penn Annual Conference**. The Veterinary and Technician Program, general information, and registration information are available and will be updated periodically as deemed necessary.

The Conference will be held at the Adam's Mark Hotel in Philadelphia on Wednesday, January 31 and Thursday, February 1, 2001. Please look for the Conference Brochure in your mail in November or take a sneak peek now by checking out our web site.

If you have any questions regarding the Conference, please call the Office of Continuing Education at (215) 898-1882 or e-mail us at: [penn-conference@vet.upenn.edu](mailto:penn-conference@vet.upenn.edu)

## SVECCS—An Active Student Group

by Amy Parkman, V'02

The University of Pennsylvania chapter of the Student Veterinary Emergency and Critical Care Society (SVECCS) has been very busy this past year. In an effort to gain more experience, over 60 SVECCS members have participated in the ES Shadowing Program in the Emergency Service at VHUP where SVECCS members “shadow” a fourth year student during this rotation. SVECCS also sponsored a lunchtime lecture series on various emergency and critical care topics.

This winter the “SVECCS Neurology Workshop” was established. This enabled students to review specially selected case studies with neurology resident, Dr. Bill Bush. The sessions served as a review of previously learned neuro exam techniques and integration of concepts into actual hospital cases.

In brainstorming sessions last spring, it became apparent that members felt they needed hands-on experience with more invasive techniques. They wanted ways to gain experience with venipuncture, catheter placement and intubation, CPR, and placement of central line catheters. With assistance from the New England Anti-Vivisection Society (NEAVS), one of the nation’s oldest and most respected animal advocacy organizations, SVECCS customized a canine vascular access model produced by Rescue Critters, Animal Mannikins.

“Critical Care Jerry”, as he is affectionately known, enables students to practice both jugular and cephalic venipuncture, central line and peripheral catheter placement, intubation, CPR, mouth-to-snout resuscitation, thoracocentesis, and bandaging techniques. Jerry approximates a 60 pound dog with a realistic mouth and airway (i.e.: trachea, epiglottis, esophagus), disposable working lungs, an artificial pulse, and a spiffy fur-like coat. This model also allows aspiration of air and fluid from the thoracic cavity via syringe (thoracocentesis). Recently, Jerry was the guest of honor at a nursing training session

involving jugular catheterization and placement of central lines. SVECCS also volunteered “his services” to the local Veterinary Medical Assistance Team (VMAT) training in the spring.

SVECCS could not find a comparable feline vascular access model, so members helped design a feline prototype through Rescue Critters. In conjunction with the section of dentistry at VHUP, a mold of the feline mouth was created. A collection of anatomical pictures and diagrams was assembled to facilitate



Students work with Critical Care Jerry.

development of the mannequin’s mouth, trachea, epiglottis, and esophagus. A student committee of both Feline Club members and SVECCS members consulted on the exact specifications for the model with Rescue Critters. “Critical Care Fluffy” has a realistic airway, disposable working lungs, artificial pulse, and various venipuncture sites. Like the canine model, Fluffy can be intubated, and has CPR and mouth-to-snout resuscitation capabilities. “Critical Care Fluffy” made her debut at the annual Feline Club wetlab and at the SVECCS venipuncture wetlab, both held in March.

With the assistance of Dr. Cindy Otto, SVECCS is also involved in organizing a disaster medicine plan for the Philadelphia region. We hope to participate in a disaster training exercise scheduled for our local Veterinary Medical Assistance Team (VMAT). The animal mannequins will provide the opportunity to practice actual critical care procedures in field training exercises. 🐾

## SCAVMA Auction

December 1, 2000 at 5 PM  
Marookian Auditorium,  
VHUP

*We invite alumni to attend and join the fun!*

The auction raises money for SCAVMA purchases that benefit the students at the School. Last year’s auction raised more than \$20,000 for various projects and the Faculty/SCAVMA Emergency Loan Fund. We hope we can top this in 2000 and are looking for donated auction items. Donations will be listed in the SCAVMA auction brochure.

Jessica Melman, V'03  
Kate Johnson, V'03  
Carrie Goldkamp, V'03  
*SCAVMA Auction Chairpersons*

**The 2001 Seminar Vacations** continuing education trip will be February 15 to 20 to Montego Bay, Jamaica. The ophthalmology seminar will be presented by Dr. Kirk Gelatt, V'65.

Seminar Vacations donates a portion of its spring veterinary continuing education seminar to student scholarship funds at the School of Veterinary Medicine. For further information, please contact Dr. Dan Bleicher, 215-886-1222 or Dr. Robert Stewart, 610-865-2611.



Award recipients Drs. Houpt, Koch and Gerson.



VMAS President Robert Stewart presents the class flag to Samantha Asikainen, V'00.



## Alumni Weekend 2000

Alumni Weekend 2000 began on Saturday, May 20, bright and early with a Player's Breakfast prior to the start of the Annual Alumni Golf and Tennis Tournaments. Despite the overcast and cool day a good time was had by all participants. In the evening Dean Kelly hosted an Alumni Reception at Allam House. More than 150 alumni and guests gathered for a festive evening.

During the Veterinary Medical Alumni Society meeting on Sunday morning, three alumni were honored for their service to the profession. Dr. T. Richard Houpt, V'50, Dr. Seth Koch, V'65, and Dr. Lawrence Gerson, V'75, each received the 2000 Alumni Award of Merit. The assembly welcomed the Class of 2000 as the newest alumni.

Alumni and their families were able to take a good look at New Bolton Center during tours of the campus. Tents were set up for the picnic lunch and entertainment was on hand for the many children who accompanied their parents. It was a festive day and preparations are already under way for Alumni Weekend 2001, on May 19 and 20.

The golf and tennis tournaments were generously supported by A.J. Buck, Ralston Purina, Novartis Health, HSB Veterinary Supplies, Inc. and J. A. Webster, Co.

# Rosettes & Ribbons

**Dr. Kenneth Bovee**, emeritus professor of medicine, was presented with the Scientific Achievement Award of the World Small Animal Veterinary Association (WSAVA) at the group's meeting in Amsterdam in April.

**Dr. Erika L.F. Holzbaur**, associate professor of biochemistry, has been appointed Keith R. Porter Fellow by the Keith R. Porter Endowment for Cell Biology. Dr. Holzbaur was recognized and honored for her accomplishments in cell biology.

The **Sigafoos Bonded Shoes®** will be available at the Olympics in Sydney. Rob Sigafoos, the farrier at New Bolton Center, developed these special horseshoes which are glued on instead of nailed. They were patented and licensed to SoundHorse Technology, Unionville.

**Dr. James Serpell**, Marie A. Moore Associate Professor of Humane Ethics and Animal Welfare, received grants from the Kenneth Scott Foundation and the University Research Foundation for research on behavioral development in dogs. Dr. Serpell was an invited speaker at the WSAVA/FECAVA symposium in Amsterdam in April. He was featured in an article in the April/May *Gazette*, Penn's alumni magazine.

**Dr. David Kritchevsky**, professor of biochemistry, delivered the Mildred A. Reeves Lecture at the University of Tennessee School of Medicine in May.

**Dr. Sherrill Davison, V'83**, associate professor of avian medicine and pathology, attended the Summer Institute for Women in Higher Education Administration sponsored by Bryn Mawr College/HERS, Mid-America. The purpose of the Summer Institute is to improve the status of women in the middle and executive levels of higher education.

**Dr. Fabio Del Piero**, assistant professor of toxicology and pathology, gave a number of presentations at the Jurak

Symposium of Comparative Pathology in Italy in June. He also gave presentations that same month at the University of Pisa, the University of Turin, and the University of Milan. Dr. Del Piero was selected by the Junior Chamber International as The Outstanding Young Person in Italy in the category "science and academia"—he will participate in the final competition in December in Sapporo, Japan.

**Dr. David Nunamaker, V'68**, Jacques Jenny Professor of Orthopedic Surgery, is a Trustee of the Arbeitsgemeinschaft fuer Osteosynthesefragen (AO), a group of international medical and veterinary researchers who teach and research fracture healing, bone development, and similar subjects. Dr. Nunamaker attended the recent meeting in Vancouver, Canada. He is president of AOVET.

**Dr. Robert Poppenga**, associate professor of pathology, has been elected president of the American Board of Veterinary Toxicology for a three-year term.

**Dr. Gerhard Schad**, professor of parasitology, presented the Stoll-Stunkard lecture at the meeting of the American Society of Parasitologist in Puerto Rico in June. Dr. Schad presented invited lectures at Heska Pharmaceuticals in Fort Collins, CO and at the AVMA meeting in Salt Lake City, UT.

**Dr. Eric Parente**, assistant professor of sports medicine, made a presentation on respiratory diseases at the meeting of the Italian Society of Veterinary Surgery in Giulianova, Italy in June. Dr. Parente has joined the section of surgery at New Bolton.

**Dr. Lesley King**, associate professor of critical care, presented courses on critical care at the British Small Animal Veterinary Association meetings in the UK earlier in the year.

**Dr. Colin Harvey**, professor of

surgery and dentistry, was the external examiner for the first Fellowship level examination in veterinary dentistry of the Australian College of Veterinary Sciences. Dr. Harvey participated via telephone in the oral examination and marked written papers.

**Dr. Linda Mansfield, V'86**, associate professor of at the College of Veterinary Medicine, Michigan State University, received the Pfizer Animal Health Award for Excellence in Research. Dr. Mansfield is an authority on the pathogenesis of *Campylobacter jejuni*.

**Dr. Amy Kapatkin**, assistant professor of surgery, received a grant from the University Research Foundation for a study on elbow dysplasia in the basset hound.

**Dr. Narayan G. Avadhani**, Harriet Ellison Woodward Professor of Biochemistry, received a grant from the University Research Foundation for the purchase of a DNA synthesizer for the Veterinary DNA Core Facility.

**Amy Parkman, V'02**, received a grant for a summer project from the Geraldine Dodge Foundation to review current disaster preparedness for animals in the Philadelphia area and to develop an information piece.

**Dr. R.H. Whitlock**, associate professor of medicine, presented a paper entitled "John's Testing in Cattle, A National Perspective" at the National Institute of Animal Health Meeting in Corpus Christi, TX in April. Dr. Whitlock continues to serve as Co-Chair of the National John's Working Group, working under the auspices of the US Animal Health Association. He was one of the speakers to discuss large Animal topics at the North Carolina Veterinary Medical Association summer conference in Myrtle Beach, SC in June.

**Dr. Dez Hughes** has been appointed assistant professor of critical care medicine.

# Veterinary Degree Opens Door to Many Career Opportunities

## An interview with an alumnus

Although many students enter veterinary school with the goal of practicing veterinary medicine, a surprising number of Penn veterinary graduates have pursued dynamic careers in other fields. An example of this trend is Dr. Paul W. Pratt, V'73. "In veterinary school I assumed I would practice veterinary medicine for 30 or 35 years before retiring. I never could have predicted the twists and turns my career has taken," said Dr. Pratt.

After graduating Dr. Pratt worked as an associate veterinarian in several small animal and mixed-species practices. "Practice was interesting and challenging. I loved working with the animals, but the financial constraints of veterinary care were often frustrating," he said.

"While researching alternatives to veterinary practice, I discovered that a degree in veterinary medicine is more than just a prerequisite for veterinary practice. It's a springboard to numerous other careers."

After four years in private practice Dr. Pratt served as a Veterinary Medical Officer with the Food and Drug Administration's Center for Veterinary Medicine. "FDA veterinarians have a grave responsibility to consumers, animal owners, and veterinary patients. They must carefully evaluate pharmacologic data to decide which drugs are safe and effective for use by veterinarians, and which should be withdrawn from the market or not initially approved for sale. Regulatory veterinarians are not on the 'front lines' of veterinary practice, but they must have clinical knowledge and good judgment," he explained.

A year later Dr. Pratt was appointed editor at American Veterinary Publications, which published periodicals and texts for veterinary practitioners and technicians. "I was very fortunate to become a veterinary editor, as few such jobs are available. It was an ideal posi-

tion that combined my veterinary education and clinical experience with my love of writing."

Dr. Pratt eventually became Publisher and CEO at American Veterinary Publications. In 1994 he was appointed Executive Editor for Mosby Yearbook, a large international publishing company. "I supervised publication of texts written by specialists in every aspect of veterinary medicine," he said. "It was a privilege to get to know the authorities who had written the texts we used in veterinary school, and also to foster the 'rising stars' in veterinary publishing."

During his spare time he obtained a certificate in Teaching English as a Foreign Language (TEFL). "Before entering veterinary school I taught in the Philadelphia School System. I find teaching very gratifying. My TEFL certificate allows me to teach English in foreign countries," he explained.

After 20 years in publishing, Dr. Pratt accepted a new challenge. In 1998 he became a volunteer with the U.S. Peace Corps. He is nearing completion of a 27-month assignment as a business consultant in Bulgaria. "I'm no longer involved with veterinary medicine, but my business experience in veterinary practice and publishing has been invaluable in

my consulting work in Bulgaria. This is ironic, as I once considered the business aspects of veterinary practice a tedious bother. Now I advise Bulgarian entrepreneurs on starting their own business. I also teach Introductory Business at the local School of Economics, and Business English at the Language School. Occasionally I present business seminars at Veliko Turnovo University, and also help train new Peace Corps Volunteers coming to Bulgaria.

"Years ago people had only two or three jobs in a lifetime. Frequent job changes were viewed as a sign of instability. Changing careers was radical," said Dr. Pratt. "Now employers consider career diversification an asset, rather than a liability. They view people with broad experience as seasoned professionals and desirable candidates for employment. I had no brilliant career strategy, but I'm pleased that my career has evolved in such a rewarding way.

"I don't know what's on the horizon after I complete my assignment with the Peace Corps. I'm enjoying the luxury of choosing among many appealing options. I feel very fortunate to have had such a diverse, interesting career. And it's not over yet!" 

## New Development Officers

Jane Simone and Joshua Liss joined the staff of the School's development office. Jane Simone was appointed as director of development at New Bolton Center and Joshua Liss was appointed director of alumni relations and annual giving.

Jane comes to the School from Albright College where she served as director of corporate and foundation relations. Prior to that, she was a major gifts officer at Duquesne University, Pittsburgh and participated in their very successful \$100 million capital cam-

paign. Jane is an accomplished rider and holds a British Horse Society certificate in Horsemanship, Stable Management and Teaching.

Joshua served as director of annual giving at Ursinus College for three years. He developed an on-campus telefundraising program, designed and maintained an award-winning development web site, and managed a comprehensive annual giving program. Joshua and his wife are owned by two toy Manchester terriers and three cats.



# Animal Crackers



## Diagnostic Ultrasound

Ultrasound has greatly expanded the diagnostic imaging capabilities for detecting and monitoring diseases in dogs and cats. It provides a safe, economical and noninvasive imaging modality for defining the soft tissue architecture of organs and structures and assessing organ function (e.g., gastric and intestinal motility, echocardiography and fetal viability). Structures containing gas and bone are very difficult to evaluate with ultrasound. The ultrasound transducer converts electrical energy into a brief pulse of high frequency sound waves which are then transmitted into the animal's tissues. The transducer then functions as a receiver, detecting echoes of sound energy reflected from the tissues that are then analyzed by a computer to produce gray-scale images for interpretation by a veterinarian.

Ultrasound has reduced the need for many contrast radiographic examinations and aids in guiding diagnostic or therapeutic needle aspirations and biopsies of organs or lesions for cytological, bacteriological or histopathological preparations. No ionizing radiation hazard or other known safety consideration is present with ultrasound.

Ultrasound images may be produced in any anatomical plane by adjusting the orientation and angulation of the transducer and patient position. Ultrasound image quality is influenced by the transducer type (different sound frequencies), gain settings, focal zone location, and patient preparation. Many of the best ultrasound machines can cost as much as several hundred thousand dollars. Patient preparation for an ultrasound study includes clipping of hair over the region of interest,

wetting of the skin with water or alcohol and the liberal application of acoustic gel to ensure good contact, thereby allowing sound transmission from the transducer to the animal's tissues. The production of quality diagnostic ultrasound images requires patience, skill, and experience by those performing and interpreting the ultrasound examination.

## Zoonoses

The transmission of diseases from dogs and cats to people is a fairly rare occurrence. Unless your immune system is impaired, you are much more likely to contract diseases from other people. There are some diseases (zoonoses) that can be transmitted from dogs and cats to humans.

**Rabies** is transmitted to humans by the bite of an affected dog or cat (or other animal).

**Dog and cat bites** are a serious problem and may cause a variety of diseases, including abscesses and tetanus.

**Campylobacter enteritis**, a disease of the small intestine, may be caused by contact with contaminated feces.

**Salmonella** organisms, which are shed in discharges from the mouth and in the feces, may cause intestinal disease in humans.

An itchy skin disease called **cutaneous larva migrans** is caused by contact with litter or soil contaminated by the feces of a hookworm-infested dog or cat.

A condition called **visceral larva migrans** may result from inadvertent ingestion of roundworm eggs in the feces of an infected animal.

**Toxoplasmosis** may be transmitted by contact with the feces of an infected cat.

A bacterial agent transmitted to people via a cat scratch causes **cat scratch**

**disease.**

**Conjunctivitis** in humans can be caused by contact with the nasal and ocular discharges of cats with feline chlamydiosis.

Transmission of disease generally requires close contact between susceptible people and secretions from the mouth, eyes, nose or feces of an infected animal. Keep toddlers away from the litter box of cats and prevent them from playing in soil or sandboxes that may be contaminated with feces. Common sense and good hygiene reduce the risks.

## Jack Russell Terriers

Parson Jack Russell (1795-1883) developed this breed to hunt the fox. The dogs followed the mounted huntsmen and their hounds. If the fox went to ground, it was the terrier's job to bolt the quarry so the hunt could continue. The breed has been described as bold, friendly, athletic, clever and overwhelmingly affectionate. He should not be quarrelsome and shyness is a fault. The coat is smooth or broken and the color is all white or white with black and/or tan markings. Markings preferably are confined to the head and root of the tail. When the dog is judged, spanning the chest is required; it must be narrow and flexible so that the dog can squeeze through a narrow opening. It is a true working terrier. When properly trained, the breed excels in obedience and agility.

The breed is now eligible for competition at the AKC championship shows. It is shown as the Parson Russell Terrier in England and as the Jack Russell Terrier in this country. It is a disqualification if the dog is under 12 inches or over 15 inches in height. In Australia, two separate types are registered—the Parson Russell Terrier (12 to 15 inch) and the

## Scholarships

The Anne Linn White Dean's Scholarships were awarded to **Jamie Murphy, V'01, Shelly Rodewald, V'01, and Elizabeth Agnew, V'01.** **Christina Fuoco, V'01,** received the Westminster Kennel Foundation Scholarship. The Dr. J.E. Salisbury Scholarships were awarded to **Meredith Borokove, V'01, Dorian Haldeman, V'01, Katherine Wentworth, V'01, Carrie Hutchinson, V'01, and Christine Gebert, V'01.** The recipient of the Charles S. and Phyllis H. Wolf Dean's Scholarship was **Jennifer Marsden, V'01** and the Bruce J. Heim Dean's Scholarships were awarded to **Meryl Gupta, V'01, and Jennifer Tavares, V'01.** **Steve West, V'01,** received the Ethel G. and Allen H. Carruth Dean's Scholarship. The Samuel T. and Emily Rawnsley Dean's Scholarship was awarded to **Kimberly Johnston, V'03.** **Gina Cairone, V'03,** received the Edwin J. Andrews Dean's Scholarship and **Nathan Harvey, V'03,** was awarded the Class of 67' Dean's Scholarship. The J. Maxwell Moran, Sr. Dean's Scholarship was awarded to **Jennifer Gschwend, V'02.** **Lisa Meddock, V'03,** received

The Palace H. Seitz Dean's Scholarship. Dr. M. Josephine Deubler Dean's Scholarship were awarded to **Brian Young, V'02, Heather Lyons, V'02, Carlin Jones, V'02, and Daniel Schar, V'02.** The Jack Mara/Hill's Scholarship was awarded to **Andrew Greller, V'02** and the Hill's Pet Products Dean Scholarship's recipient were **Adrienne Hancock, V'02, Angie Cheek, V'02, and Katherine Masek, V'02.** **Tracy Filler, V'02, and Jeffrey Luetke, V'02,** received W.L. Montgomery Scholarships. The Clifford F. Wright, Jr. Scholarship was awarded to **Diane Gabriel, V'01.** **Katherine Bate, V'01,** received the Dr. Ginnie Lieblein Memorial Scholarship, and **Beth Adler, V'01,** was awarded the Richard A. Dorr, Jr. Memorial Scholarship. The Anna Live Endowment Fund Scholarship was awarded to **Rene Varela, V'01.** **Cailin Galvin, V'01,** received the Iris M. McGee Scholarship and the Hill's Dean's Scholarship was awarded to **Katherine Masek, V'02.** **Carlin Jones, V'02, and Lise Lund, V'00** were awarded the Csaba Vedlik Scholarships.

Jack Russell (10 to 12 inch).

Most breed experts agree that the Jack Russell Terrier is not the right choice for a first-time dog owner. The owner must understand terriers and how to establish dominance. Take time to study the breed, talk to owners and don't let the television "actors" influence your decision to make a Jack Russell Terrier part of the family.

## Book Review

*Lowell—The True Story of an Existential Pig* by **Gay L. Balliet** (New Horizon Press. Hardcover. \$ 23.95).

This is a story of life with a Vietnamese pot-bellied pig. Lowell watches Oprah, listens to Gloria Estefan and in general has a remarkable life and relationship with his owner.

Although there are pet pigs in many households, they can become problems. When they grow up, they may not be as cute. A prospective owner should understand the care needed and proper man-

agement. Over-feeding must be avoided, many overweight pigs are abandoned. Pigs may be housebroken, even trained to use a litter box like cats. Pigs are highly intelligent. Their eyesight is poor but they have an excellent sense of smell and have been used for sniffing out drugs, locating landmines, and unearthing truffles.

Babe and Charlotte's Web are stories that have delighted many readers. Lowell is not a fictional pig and his true life story makes interesting reading.

## DNA Screening Test *(continued from page 11)*

specific. Diseases may appear the same in a number of breeds, but closer examination at the molecular level often reveals differences in the type of DNA mutation from breed to breed. Thus breed specific tests are needed.

In VHUP's clinic, particularly through the pediatrics and genetics clinic, quite a few new inherited diseases have been identified, leading to a better understand-

## Very Special Gift

For many years John and Dorothy Leonard of Berkeley Hills, CA bred and exhibited Yorkshire terriers under the Dorchester prefix. Mr. Leonard, a member of the Wharton Class of 1936, showed and handled his dogs until recently at California shows. Mr. and Mrs. Leonard made a gift to VHUP to name an examination room in memory of their Dorchester Yorkshire terriers. The Leonards have retired from breeding and exhibiting their Yorkies, though they do enjoy watching the breed from ringside.

## Join Us for the American Gold Cup

September 14-17 at the  
Devon Show Grounds,  
Devon, PA

ing of the disease and, in some cases, to tests which help breeders reduce the incidence of a particular condition. The identification also has led to new animal models of human disease, helping scientists in the study of the disease process and in the development of treatment modalities. This benefits the animal and human patients. 🐾

# Teaching Awards

Students, faculty and staff sailed the Delaware on The Spirit of Philadelphia for a night of dinner, awards and dancing on April 15. It was the evening of the Veterinary Medical Student Government Teaching Awards. The late Dr. Eric Tulleners, Lawrence Baker Sheppard Professor of Surgery, received the Alumni Teaching Award posthumously.



Dr. Dean Richardson, Charles W. Raker Professor of Equine Surgery and Chief of Large Animal Surgery, received the Carl J. Norden Distinguished Teacher Award established in 1963 "to recognize outstanding teachers who, through their ability, dedication, character and leadership, contribute significantly to the advancement of the profes-



The Dean's Award for Leadership in Clinical Science Education was presented to Dr. Dorothy Brown, assistant professor of surgery.



The Dean's Award for Leadership in Basic Science Education was presented to Dr. James B. Lok, associate professor of parasitology.

The Student Government Awards for Teaching Excellence were presented by each of the four classes to honor an individual "who exemplifies the highest degree of proficiency" in teach-



The class of 2003 Teaching Award: Dr. Paul Orsini (r), assistant professor of anatomy.



The class of 2002 Teaching Award: Dr. Linden Craig (l), staff veterinarian in pathology and toxicology.



The Class of 2001 Teaching Award: Dr. Patricia Sertich (l), assistant professor of reproduction.



The Class of 2000 Teaching Award: Dr. Cynthia Ward, assistant professor of medicine.



Dr. Matthew Nicholson received the Class of 2000 Award to an Intern Demonstrating Outstanding Teaching Ability.



Dr. Jeffrey Wortman, associate dean for curricular affairs, received the Veterinary Medical Student Government Commendation Award.



Dr. William Bush (l) received the Intern's Mentor Award for Outstanding Teaching by a Resident.



Dr. Lillian Aronson received the Jules and Lucy Silver Animal Bedside Award for concerned communication and compassion for each client and animal patient.



Jennifer Wrigley, a veterinary technician at New Bolton Center, received the Class of 2000 Veterinary Technician Teaching Award. She also received the Gretchen Wolf Swartz Award for Outstanding Nursing at New Bolton Center.



Dr. Yvonne Elce received the William B. Boucher Award for Outstanding Teaching at New Bolton Center by a House Officer.



Colleen Klein (r), a veterinary technician at New Bolton Center, received the Veterinary Technician Teaching Award presented by the Harcum College Practicum students.

Dr. Beth Callan, assistant professor of medicine, received the Residents' Award for Outstanding Teaching by a Faculty Member. Dr. Patricia Kull received the Class of 2000 Award to a resident demonstrating outstanding teaching ability.



Roxanna Bachman (r), a veterinary technician at VHUP, received the Class of 2000 Veterinary Technician Teaching Award and the Veterinary Technician Teaching Award presented by the Harcum College Practicum students.



Theodore Pitt of New Bolton Center received the Veterinary Medical Student Government Commendation Award.

## Fun for the whole family School's Open House

September 23rd at  
New Bolton Center,  
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75	8.2%	\$4,327	\$820
80	9.2%	\$4,722	\$920
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\* Charitable deduction will vary slightly with changes in the Federal Discount Rate.

\*\* Annuities with an income beneficiary above 82 will receive a higher income tax deduction depending on the age of the beneficiary.

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A gift was made to Friends of New Bolton Center in honor of Dr. Wendy Freeman: Judith C. Herdeg and Muddy Ruts Farm

A gift was made to Friends of New Bolton Center in honor of Dr. Jill Beech and in memory of "CINDERS":

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A gift was made to Friends of New Bolton Center in honor of E. P. Althouse, '03: Kenneth E. Diehl, V.M.D.

The following gifts were made to Friends of New Bolton Center in memory of a beloved animal:

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Mrs. Theresa A. Zappone in memory of her dog "SUNSHINE"

and her horse of 26 years, "DOUBLE SCOTCH"

A gift was made to New Bolton Center in memory of Mr. Hardie Scott:

Ms. Catherine C. Larmore

A gift was made to the Peter A. Lien Memorial Fund in memory of Edward Sleger:

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The following have made gifts to the Small Animal Hospital in memory of a special pet:

Mr. Fred and Mrs. Deidre Anderson in memory of "SPARKY"

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Ms. Roberta Tanenbaum in honor of Dr. Patricia Kul

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Ms. Shari Silverman in memory of

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**The following have made gifts to Clinical Studies Junior Faculty Research Fund in memory of a special pet:**

Ms. Nancy Sullivan in memory of “JUNE”

**The following have made gifts to Clinical Studies in the area of Oncology in memory of those listed:**

Mrs. Jennifer Dotts in memory of Marilyn Sebastian Maloney

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Ms. Beth Maurer in honor of Drs. Lillian Duda, Jennifer Baez, and Lisa Barber

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Join Us for the  
**American Gold Cup**  
 September 14-17 at the  
 Devon Show Grounds, Devon, PA

and the

**School's Open House**  
 September 23 at  
 New Bolton Center, Kennett Square, PA

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We'd like to hear your praise, criticisms, or comments. Please address your correspondence to:

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**Calendar**

September 14-16	The American Gold Cup, Devon Show Grounds, Devon, PA
September 23	Open House of the School of Veterinary Medicine, New Bolton Center
January 27	Canine Symposium, VHUP
January 31-Feb. 1	Penn Annual Conference, Adams Mark Hotel, Philadelphia
March 24	Feline Symposium, VHUP

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