The Animal Health and Diagnostic Commission of the Commonwealth of Pennsylvania has established a comprehensive mammalian diagnostic laboratory system to provide services to the agriculture industry. The School's laboratory of large animal pathology is an integral part of the new three-laboratory network.

"Basic services are provided at each of the three locations," said Dr. Helen Acland, associate professor of pathology and head of the laboratory of large animal pathology. "In addition each of the laboratories offers specific specialized diagnostic services. This eliminates duplication and is more cost-effective."

Penn's laboratory at New Bolton offers, in addition to basic services, specialized services in microbiology and toxicology, the latter in cooperation with West Chester University. The other two laboratories in the network, the Commonwealth Department of Agriculture Diagnostic Laboratory at Summerdale and the laboratory at Penn State University, have their own specialties. The Summerdale location concentrates on regulatory serology and the Penn State facility handles diagnostic virology.

"A client can bring the animal or blood or other samples to any of the three locations," said Dr. Acland. "If specialized tests are required, the receiving laboratory sends the samples to the appropriate laboratory and be the contact with the client." Fees for these services are subsidized by the Commonwealth, resulting in minimal expenses to the livestock owner.

"Prompt identification of an infectious disease or a toxic substance can prevent losses in a herd or flock," said Dr. Acland.

As each laboratory is equipped to accept any kind of a problem, the livestock owner has to deal only with one facility and not worry about having to send samples to different locations."

The New Bolton Center laboratory for large animal pathology works closely with the School's microbiology and clinical pathology laboratories and thus is able to offer a multitude of tests, ranging from biopsy analysis to culture and sensitivity tests to clinical chemistry. The pathology laboratory services are available around the clock for emergencies. "We have always been a major diagnostic resource to the agriculture industry," said Dr. Acland. "Now as part of the Commonwealth Animal Health and Diagnostic System we can provide even more comprehensive services to our clients and expand our training facilities for veterinary students."

Clients can reach the laboratory at (215) 444-5800, extension 2211, to make arrangements to drop off samples or animals for necropsy.
Dear Friends:

Many schools and colleges of veterinary medicine have gone through a transition from an era of economic growth and academic complacency, to one of financial constraint and academic reality. What is happening in veterinary medicine is no different than in higher education in the United States, which is clearly under financial siege. Veterinary education has been struggling to clarify its identity for the next century. The profession itself faces a diminishing influence as the agricultural enterprise of the country continues to shrink and the competitiveness and entrepreneurial nature of veterinary practice changes.

As an institution built on a historic foundation of leadership, we have survived through this economic strife. By the time that this message is printed, I am hopeful that we will have once again justified a restoration and, in fact, an increase in our support from the Commonwealth of Pennsylvania. Our ability to maintain a quality core will always depend on state funding. However, our ability to grow, meet new demands and optimize our strengths, will depend on new sources of funding.

In my recent five year report to the faculty, I detailed our many accomplishments through these difficult times. I also reflected on the planning and task force efforts which resulted from the Pew Process, and which suggested that the School’s greatest strength lies in its research ethic. Our focus for the future, therefore, is clear. First, we must maintain all of our sources of core funding, most importantly that from the State. Second, we must develop a means of funding our growth, our new initiatives and, the further strengthening of our existing programs. Third, we need to direct our focus to research in all of its dimensions, but without sacrificing the quality of our educational or service programs.

Those educational institutions with a clear purpose and sustained funding will be the leaders in the next century. This is especially true of schools and colleges of veterinary medicine. We at Penn have every intention of being at the top of that category.

Your continued support of our efforts and interest in the School is appreciated.

Edwin J. Andrews, V.M.D., Ph.D.
Dean

Dorothy Russell Havemeyer Barn

The Weaver Barn, located at the Hofmann Center, was renamed and dedicated the Dorothy Russell Havemeyer Barn on April 9, 1992. The 19th century Pennsylvania bank barn was recently renovated to house an equine reproductive behavior and physiology research facility. The renovations, funded by the Dorothy Russell Havemeyer Foundation, Inc., included tie and box stalls for ponies, a small office area, a laboratory, storage and an observation area. They also included repair of interior structural elements, and exterior elements such as existing windows and doorways, to preserve the appearance of this historic structure while providing up-to-date animal facilities and research space.

New Chairman for Board of Overseers

Mr. William Schawbel was appointed the new chairman of the School’s Board of Overseers. Mr. Schawbel is a 1961 graduate of the Wharton School of Finance and Commerce. He spent 19 years at The Gillette Company where, among other assignments, he served as general manager, Gillette-Japan, and president of its Braun North America division. In 1981 Mr. Schawbel formed the Schawbel Corporation in order to acquire Braun North America from The Gillette Company. The Gillette Appliance Division was acquired the following year. The acquisitions were the forerunners of the company’s involvement in the personal care appliance business. In 1993 the company was expanded by its addition of Ha. Hovey Company, an institutional food distributor. The Schawbel Corporation has developed and been involved in the creation of numerous business and products in the housewares, hardware, food, and consumer products industries, and, with its patented Thermacell technology, is one of the world’s largest manufacturers of butane powered personal care appliances and hardware products.

Mr. Schawbel and his family reside in Needham MA. He serves as co-chair of the Minority Permanence Committee of the University of Pennsylvania, and is a member of the Board of Advisors at the Wharton Entrepreneurial School. Mr. Schawbel also serves on the board of The Boston Latin School Foundation, is chairman of their Case Study Committee, and serves on the board of A Different September Foundation, and Junior Achievement of Eastern Massachusetts.

At the dedication of the Havemeyer Barn (l. to r.) Mr. William Schawbel, chairman, board of overseers, Mr. Gene Pianzo and Mr. Roy Tarlow, trustees, Dorothy Russell Havemeyer Foundation, Dean Edwin J. Andrews.
Regaining a Perfect Stride

Thoroughbred horse owners recognize the disease known as "wobbles" but very few are bold enough to admit one of their horses has the disease. In the past diagnosis of wobbler syndrome has meant the future for the horse was bleak at best. The disease is particularly prevalent in Thoroughbred horses. Wobbles is characterized by incoordination, ataxia and leg weakness that usually begins in the hind legs but can progress to involve the forelimbs as well. There are several diseases which can cause "wobbles" in young horses but in each disease the spinal cord in the neck is damaged. The most common causes of spinal cord damage in young Thoroughbred horses are cervical vertebral malformation/malarticulation (CVM), equine degenerative myeloencephalopathy (EDM); equine herpesvirus-1 myeloencephalitis; equine protozoal myeloencephalitis (EPM); spinal cord trauma; and, trauma to the vertebrae of the neck. These diseases can occur any time in the life of a horse but are more commonly seen during the first two years.

Unfortunately, early subtle signs of these diseases can be overlooked or be initially attributed to clumsiness. Even when dramatic acute signs are observed, diagnosis based on clinical signs and ancillary tests may not be possible. In spite of the progress made by veterinarians in recent years, improved techniques for diagnosis and treatment of spinal cord damage in young horses are still needed. Early, specific diagnosis and treatment could limit damage to the spinal cord and allow affected horses to recover completely.

At the University of Pennsylvania's School of Veterinary Medicine, we have concentrated our efforts on methods to improve the diagnosis and treatment of cervical vertebral malformation/malarticulation of wobbles. We feel that spinal cord damage is caused by direct damage to the spinal cord by the neck bones. When the spinal cord is damaged it is inflamed or damaged, messages from the brain do not arrive. Untreated, the damage to the spinal cord progresses until the horse has difficulty in walking and becomes a danger to those who must care for it. The damage is very similar to the spinal cord injury a human being can experience by hitting the head and flexing the neck during a dive into shallow water in a swimming pool.

The role of heredity in CVM has been debated for years. CVM has been seen in certain Thoroughbred horse families leading investigators to speculate that it might be passed on from one generation to the next. We have observed that the spinal canal in the neck of young horses varies considerably in size. The spinal canal is largest in female foals. Those foals that develop CVM are males, it may be that a sex related characteristic predisposes young male Thoroughbred horses to CVM because they are born with a narrower spinal canal and pinching of the spinal cord can occur more easily.

CVM has been proposed to be a "developmental orthopedic disease." With this in mind, a relationship between nutrition and the occurrence of CVM has been suggested. It has been found that horses with CVM have been overfed relative to other horses. This in turn causes rapid growth. It has been well demonstrated that overfeeding of a high protein, high energy diet to young growing animals and children can cause bony deformities. For instance, great Danes developed spiral cord compression when overfed from birth. On the basis of numerous indications that over nutrition is associated with the development of orthopedic diseases, such as CVM in horses, we undertook a study to determine if CVM could be diagnosed early in life in Thoroughbreds foals and, if CVM was found, we wanted to see if dietary restriction along with confinement could eliminate the neurologic signs and correct the bony abnormalities.

Our work has been conducted on a Thoroughbred breeding farm in central Kentucky, between 1986 and 1990. The international research team includes Dr. Jan (Joe) Mayhew, a world renowned veterinary nutritionist from Newmarket, England: Dr. Sherrill Green, from the Ontario Veterinary College at the University of Guelph in Canada; Dr. David Galligan, a veterinary nutritionist at the University of Pennsylvania; Lisa Stanley, a graduate student; and myself. The farm experienced a high incidence of CVM before and during the study. During the five years 132 foals were born to 43 mares on the farm. Eighteen of the foals developed CVM.

To diagnose the condition early, often even before neurologic signs developed, we took radiographs of the necks of the young horses. The neck bones were examined for such things as narrow spinal canal, abnormal growth of the joint connecting the neck bones, abnormal growth plates at the ends of the neck bones and enlarged bone spurs over the spinal canal. The changes were graded for each of the seven bones of the neck and the radiographs on each foal were given an overall CVM score. The scale was zero (perfect) to 9. Through experience, we found that when the overall CVM score was greater than 12 there was a high probability that the young horse had or would soon develop neurologic signs of CVM. Hundreds of radiographs have been scored and the results have been entered into a computer so that when new horses are examined they can be compared with horses seen in the past. In this way, the accuracy of our diagnostic methods has continued to improve with time. We can now examine a set of neck radiographs taken with the young horse standing, not under anesthesia, and based on the radiographic score, predict whether there is cause for concern.

All of the foals, weanings and yearlings, on the Kentucky farm were examined every three to four months to see if they had developed any signs of neurologic disease. In addition, they were weighed on a weekly basis to monitor their growth rates. If a young horse developed clinical signs of spinal disease and it had a high overall CVM score in its neck radiographs it was treated in two ways. First, the young horse was confined to a stall to limit neck movement and activity. Secondly, it was placed on a restricted diet to slow growth and offer time for bone remodeling. The young horses were fed between 65 and 75% of the normally recommended amounts of protein and energy. Special attention was taken to insure all of the necessary vitamins and minerals were given and to be sure that the diet was balanced in other ways.

We were gratified when we saw the first of the treated horses recovered completely. We have been astonished to see that all 18 of the treated horses have recovered completely. It has taken about 9 months of treatment before the improvement in the neck has been sufficient to permit discontinuation of the diet and confinement. It is important to note that all of the treated animals were less than one year of age when treatment was started. We believe this fact is very important. Success is undoubtedly dependent on starting treatment when bone growth is most rapid. All 18 of the treated horses have entered race training. Of the ten horses treated between 1986 and 1988, which are now old enough to race, seven have raced, and 5 have won at least one race. In actuality, the 5 horses that have raced have won a total of 14 races!

We have expanded our studies to include young horses at other farms throughout the United States and Canada. Working closely with local veterinarians and owners it has been possible to achieve gratifying results in these less well controlled surroundings, as long as the owners, trainers and veterinarians adhere to the program and are understanding. It is hard for owners to see their animals confined for long periods and to be unthrift. There is the temptation to want to add food or turn the young horse out for exercise, both of which can undo all that has been accomplished. From experience we know the horses will grow and reach their predestined potential, but it is hard to convince others in the midst of treatment.

The future holds great promise. The accuracy of our ability to diagnose CVM will undoubtedly improve as our base of information increases. Further study will enable us to determine what specific dietary changes are making the most impact in treatment of the disease. The knowledge gained during our studies of the horse may have broad application to other species including man. For the Thoroughbred industry, the role of diet for the young horse must be underscored as breeders think towards the future and their chances for success of consistently making it to the winners circle.

William J. Donawick, D.V.M.
Mark Whittier and Lila Griswold Allam
Professor of Surgery
The most common signs of hypothyroidism are skin scaling and crusting, hair loss, itch, and bacterial infections as well. Seborrhea is often confused with ringworm and mange, causing problems in diagnosis. As with atopic allergies and other dermatologic diseases such as seborrhea, it is important to bear in mind that the skin is affected by that which is on the inside and that which is on the outside. This in-between position between two worlds often makes it difficult for dermatologists to understand the complexity of the various diseases they have to treat.

Vaccinations: The Good and the Bad

Distemper used to be a major killer of dogs, but today, thanks to vaccines, it is rarely seen by veterinarians. Even the most recent canine viral disease, parvo, has been curtailed through vaccination programs. Dr. Peter F. Jezyk, adjunct associate professor of medical genetics, presented an overview of the immune system, how vaccines stimulate it into action, and why vaccines may cause problems such as allergies.

Vaccination can be defined as the administration of an antigen to induce specific immunity in an organism or related organisms. It is not a drug. There are many different vaccines, killed vaccines consisting of virus proteins, subunit vaccines, killed vaccines consisting of virus proteins, are very safe, but produce limited response. Killed virus vaccines produce a more diversified response, but limited duration of immunity. Modified live vaccines best fulfill the requirements for a vaccine. Here the virus has been modified to lose its disease producing qualities, while retaining its antibody-stimulating properties, which produce the best response and longest lasting immunity.

A vaccine should induce these various responses without causing disease. Once such a response has occurred, the stimulated immune cells develop a memory. If the animal is challenged again, a response occurs and the cellular memory fades, thus regular booster vaccinations are needed to stimulate antibody production. Also, to be protected against some diseases, a series of initial vaccinations is necessary to stimulate antibody production. Leptospirosis is such a disease. For a dog to be protected a minimum of two vaccinations have to be given to three weeks apart.

Dr. Jezyk explained that a variety of vaccines are produced for protection against bacterial, viral, helminthic and other diseases. He stated that no vaccine can be 100% safe or effective because a number of factors may interfere. For example, passive maternal immunity can inhibit an active immune response in a young puppy. At birth puppies have only about 3 to 5% of maternal antibody serum titer. They receive 80 to 90% of their maternal antibodies from the colostrum while nursing during the first eight hours of life. Maternal antibodies are absorbed through the gut only after the first 24 hours of life, with absorption declining after that. Passive immunity is not very important that pups nurse as soon as possible after birth. Maternal antibodies decrease by half every nine days in the young puppy. They provide vital protection during the early weeks of life as a puppy’s immune system is immature. Passive immunity is not important until adequate cell-mediated responses until about 12 weeks of age. Thus initial repeated vaccinations are needed and timing is critical.

Dr. Jezyk stated that the immune response varies from animal to animal and that it is genetically controlled. Some animals may develop a response after one vaccination while others need repeated doses. There are some animals which may develop no immune response to certain antigens. Vaccines which are formulated to elicit a broad response therefore protect the largest possible population.

Dr. Jezyk pointed out that some vaccines are not without problems. Such problems are not due to the vaccine but to the animal’s general condition or a disorder of regulation of its immune system. One should vaccinate only healthy animals as infectious agents can interact in an undesirable way with a vaccine. Some immunosuppression can result from interaction of the distemper and adenovirus components and increase susceptibility to infection. Vaccines also can provoke an autoimmune response, such as immune mediated hemolytic anemia, but this occurs in animals genetically predisposed to such disease.

Dr. Jezyk stressed the importance of the proper route of administration for a vaccine. If the mucosal defenses need to be activated, then the vaccine should be administered oronasally. Other vaccines are more effective if given intramuscularly or subcutaneously. It is important to follow the manufacturer’s instructions to get the most effective protection.

During the question and answer period Dr. Jezyk touched briefly on vaccination programs and pointed out that such a program depends on the animal’s lifestyle. A backyard dog is much less likely to be exposed to infectious diseases than a show or hunting dog or a dog that runs in city parks. It is best to check with the veterinarian for the most effective vaccination program. He also pointed out that older dogs need regular vaccination boosters because the immune responses slow down with the animal’s age. Vaccines are an inexpensive and effective way to control infectious diseases and prevent the spread of such diseases.
Diagnosis, Screening and the Prevention of Heartworm Infection

By treating with prescribed dosages of existing filarial drugs, dog owners can effectively prevent heartworm infection - dirofilaria - from afflicting their dogs, according to Dr. David H. Knight, professor of cardiology. In his lecture, Dr. Knight discussed heartworm infections, screening methods, prophylaxis and treatment of infection.

"Caused by the parasite, Dirofilaria immitis, "heartworm" is somewhat of a misnomer, as adult parasites settle primarily in the pulmonary arteries, where they can obstruct blood flow and cause pulmonary hypertension, chronic congestive heart failure and formation of granulomas in the lung parenchyma.

The female worms, which reach about 30 cm at adulthood, mate with the smaller males. The offspring, microfilariae, are released into the bloodstream, from which they are eventually extracted by feeding mosquitoes. After the ingested microfilariae mature into infectious larvae, they are returned to dogs when the infected mosquito feeds again. The larvae migrate through the tissue for 50-70 days, then they penetrate the veins and travel through the blood stream to the pulmonary arteries to mature and procreate. The entire life cycle takes six and a half to seven months, and the worms can continue to release microfilariae for several years.

Among the signs of infection caused by adult worms are cough, weight loss, fatigue and sometimes in the worst cases, fluid accumulates in the abdomen, as they develop heart failure. Kidney and lung damage may also be caused by microfilariae.

One of the most critical risk factors for heartworm infection is exposure to blood sucking mosquitoes. In the eastern seaboard, Gulf states and drainage area of the Mississippi River were hotbeds of infection. But today, even the West Coast, where coyotes are also an important reservoir of infection, experiences a high incidence of heartworm in some areas.

Transmission of heartworm infection is a seasonal phenomenon. A dog is more apt to become infected at a time of year when mosquitoes are in abundance, such as during July and August. Transmission has not been documented from December to April, even in southern states. In the Philadelphia area the season is probably limited to May 1 to December 31. Diethylcarbamazine can be toxic when given at nine to ten times the prescribed dosage.

While heartworm prevention is generally recommended, continual surveillance of untreated dogs is essential. The most useful screening methods utilize serologic tests, which detect the presence of antigens from adult parasites. Antigen tests identify infected dogs and complement radiographic examinations which are used to determine the extent of heartworm disease.

Many veterinarians also perform parasitologic tests, which can detect the presence of microfilariae in the blood. This test is not always reliable because 20-25% of infected dogs do not have microfilariae in their blood. Many of these dogs do not have circulating microfilariae, even though the adult worms are present and reproducing because they have had time to accumulate worms.

Heartworm tests performed is not a foolproof method of detecting the presence of the parasite. Heartworm cannot be detected until at least six or seven months after it is contracted. Change of seasons should also be considered. A young dog that has just gotten through its first summer should not be tested until the following spring, for the same reason cited above.

Annual screening of dogs undergoing prophylactic treatment is only recommended if drug compliance is in doubt. If a dog exhibits symptoms of heartworm infection - chronic cough, labored breathing and listlessness, etc. - it should be immediately screened for infection. Disease symptoms from heartworm infection most commonly occur in dogs four to five years of age, because they have had time to accumulate worms during several transmission seasons. A few parasites usually can be tolerated, and clinical signs are normally absent in lightly infected dogs.

Preventive drugs, which cost $15-$25 per year for a 50 lb. dog, are preferable to treatment of infection. No single drug kills both adult worms and microfilariae. IV doses of an organic arsenic compound are used to kill adult worms, while high doses of ivermectin are prescribed to eliminate microfilariae. Treatment of infection, which ranges between $250 and $300 depending on the diagnostic tests performed, is not 100% effective against adult worms. But when it is, the dog may temporarily suffer pulmonary embolism and thrombosis with bleeding in the lungs which must absorb and remove the dead parasites. Approximately one week after adult heartworm treatment, the dog may develop a fever and show signs of respiratory distress, so it is best to treat lightly infected dogs before the disease becomes serious.

Heartworm today maintains a strong foothold around the world, after a tremendous surge in the last 20-30 years. Clearly, compliance with effective regimens for prevention must be encouraged.

Common Parasites of Canines and Their Control

In his discussion of common canine parasites, Dr. Thomas Nolan, clinical veterinary parasitologist at VHUP, focused on parasite life cycles, routes of transmission, infection and disease symptoms, and control measures.

Dr. Nolan stated that parasites were found in 25% of the 908 fecal studies done in the VHUP’s parasitology laboratory last year. He differentiated between infection and disease, infection occurring when an animal harbors a parasite, and disease being manifested in damage caused by a large number of parasites in the infected animal. Infection results in disease in puppies (dogs under one year) more frequently than in adult dogs, because puppy immune systems are immature.
In Nolan's lab, 90% of cases of *Toxocara canis*, roundworm, have been found to occur in puppies less than one year old, and virtually all cases where disease has resulted have been in puppies. Adult worms are found in the small intestine. In puppies less than six weeks old, larvae penetrate the intestinal wall into a blood vessel. They travel via the blood stream to the lungs. They are coughed up and then swallowed, to return to the small intestine to mature. Here, they produce a million to 1.5 million eggs per day which are released into the dog's feces. Direct transmission of infection to other dogs results through contact with areas contaminated with feces. At age three months, puppies start to develop an immunity to roundworms and the larvae usually arrest in the tissues, where they do no harm. In pregnant female dogs, however, they become reactivated by the hormonal changes. They migrate to the small intestine to mature, or penetrate the placenta and settle in the puppies' livers or migrate to the mammary glands, where they are transmitted to suckling puppies.

Symptoms in puppies are coughing, vomiting worms, diarrhea and malnourishment that sometimes causes a potbellied appearance. Treatment, which prevents symptoms, should occur in the bitch prior to whelping. Puppies should be treated within the prepatent period, which is the time from initial infection to offspring at the time at which the larvae have matured and are reproducing. This is normally 4-5 weeks after the puppies are born.

Though quite resilient, *Toxocara* eggs are subject to desiccation. Dr. Nolan recommended keeping the puppy area clean and dry. The eggs in the feces mature in approximately two weeks, so the feces should be removed immediately. Concrete runs are very effective in preventing the eggs from washing into the ground and are easy to clean. Hookworms, *Ancylostoma caninum*, ranked second highest in frequency at VHUP last year. Normally transmitted when puppies ingest larvae with the mother's milk, it may also be those in direct contact with contaminated soil. Once ingested, larvae penetrate the intestinal walls and migrate throughout the body. In adult dogs, they either arrest in the tissues or go back to the small intestine. In females, the larvae become active late in pregnancy, and migrate to the mammary glands or, less often, the placenta.

Adult worms use their long, toothed mouths to latch onto intestinal tissue in search of blood vessels to pump. Immune systems in adult dogs combat them effectively, and any blood loss that they cause is usually insignificant. In puppies, however, the same amount of blood loss may cause anemia. Puppies' gums and eyes should be examined for patience. Diarrhea and tarry stools full of undigested blood are also signs of hookworm. Adult worms show up in puppies about two weeks after they have started to suckle an infected mother, and disease can be acute. According to Dr. Nolan, a puppy can be anemic one day and dead the next.

Recommended control measures are medication, which is effective, timely removal of feces and drying of contaminated areas to kill larvae, which hatch from their eggs in 24 hours.

Whipworm, *Trichuris vulpis*, is the most common gastrointestinal parasite, according to Dr. Nolan. It is said that it is hard to diagnose because these worms lay fewer eggs. Present in 95% of the dogs tested at VHUP in 1991, whipworm is transmitted through ingestion of the eggs in small intestine. Adult worms embed their long, narrow frontals into the lining of the cecum and large intestine. This weakens the walls and causes damage, which can result in bloody diarrhea and weight loss. However, symptoms only occur when many worms are present.

The hardy whipworm eggs can survive in the environment for as long as two years, so it is important to remove the feces promptly and keep the dog's area dry. The prepatent period is three months and eggs can be administered four times per year as a prophylactic if there is no way to prevent infection because of a severely contaminated environment. Some drugs are effective when the worms are still in their larval stages.

*Dipylidium caninum*, the common tapeworm, uses suckers to attach itself to the small intestine lining, but it rarely causes tissue damage. Its segmented body, which appears ribbon-like, is comprised of proglottids, motile sections of reproductive organs which are full of eggs. Upon ripening, the millimeter-long proglottids break off and pass out with the feces. They quickly crawl out of the feces and rupture, releasing their eggs, which are eaten by larval fleas. Once mature, an infected flea transfers the dog, and then, in biting back, ingests the larval tapeworm which is within the flea.

No disease symptoms are displayed in an infected dog. The only signs are minor intestinal bleeding and diarrhea sometimes occur. Within two weeks after infection, the puppy's immune system is usually able to purge itself of coccidia. The cysts are very susceptible to desiccation, so it is important to keep the dog's area dry and remove the feces quickly.

*Giardia* are transmitted by ingestion of waterborne cysts. They hatch and replicate in the small intestine, on which they form a thick layer. They may cause malabsorption in the dog, because food particles are not absorbed as they travel to the intestine. Fats, least likely to be absorbed in this scenario, are usually washed out; causing the stool to appear full of mucus. Malabsorption occurs only in extreme circumstances, because older dogs usually develop immunity to *Giardia*. It normally doesn't cause much damage in puppies, who usually contract it from their mothers, although chronic diarrhea may occur. The most important control measure is to keep the dog's area dry and prevent the dog from drinking from streams and puddles. Also, timely feces removal is crucial.

Worming should be done when puppies are about two months old. Dr. Nolan cautiously recommends treating against overwounding, which can cause other health problems.

The ectoparasites Dr. Nolan discussed were lice, *Linognathus setosus*, and *Psylla canis*. The eggs live in the skin and cause mange and weasels, and those that live in the fur and frequent the skin only eat. Mites complete their life cycle on the dog. For prevention and treatment of mites, Dr. Nolan suggested dipping the dog, and also keeping its area clean.

Fleas lay their eggs on the dog or in the environment. The eggs are very resistant to chemicals, so it is necessary for the dog to be sprayed with a chemical that will outlast the incubation period, anywhere from two days to two weeks, or to spray weekly. Vacuuming is somewhat effective. Adult fleas cannot go for a dormant stage if no food is available, so vacant homes that were infested should be treated if they are going to be inhabited in the same year.

J.C.

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**Strides in Biomedical Research**

**Researchers Have Conquered Diseases and Discovered Better Medical Treatments Through Work With Animal Models**

The use of animals in research has dramatically changed the face of human existence. Over the last century, medical breakthroughs using animal research have been made by the health organizations such as the National Institutes of Health, pharmaceutical firms and universities, to stamp out diseases such as tuberculosis, polio and diphtheria. This research has also led to improved treatment for current major killers: heart disease, cancer and diabetes.

Since the 1950s, deaths from heart disease has dropped by 4 percent each year, death rates due to AIDS has decreased 2 percent annually. Approximately 50 million Americans who would be at risk of death from hypothermia are alive because of medical discoveries to treat their conditions. Animal research helped perfect coronary bypass surgery, which has benefited an estimated 200,000 bypass patients annually.

The recent development of a mouse model for AIDS, and promising work in the development of an AIDS vaccine using primates, will help scientists made greater progress in determining the best way to treat that disease. Half a million insulin-dependent diabetics survive today because of the discovery of insulin and current diabetes research with animal models.

Dialysis extends the lives of patients in kidney failure, and another 10,000 people with kidney failure are added each year. The use of animals in research has dramatically changed the face of human existence. Over the last century, medical breakthroughs using animal research have been made by the health organizations such as the National Institutes of Health, pharmaceutical firms and universities, to stamp out diseases such as tuberculosis, polio and diphtheria. This research has also led to improved treatment for current major killers: heart disease, cancer and diabetes.

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Cardiovascular Disease
Renowned open-heart surgery pioneer Dr. Michael DeBakey describes the link between animal research and heart disease in these terms: "Every major medical advance we’ve had in cardiovascular research comes from the heart, and it’s made possible by the use of animals." Dr. DeBakey, chairman of the department of surgery and director of The DeBakey Heart Center at Baylor College of Medicine, said neither the heart-lung machine nor the techniques and machines surgically used to save a human heart would be available without animal research.

The heart-lung machine required over 20 years of experimental work before it was perfected for use on a human heart, he said. "Even today’s technology, I would not use a computer to develop the roller pump that made open-heart surgery possible, or the artificial heart that restored hope to prevously doomed patients with aneurysms. Nor could we have attempted the first successful coronary bypass or implanted the first temporary mechanical heart, with which we saved a patient’s life two decades ago. Think of all the infants with congenital heart failure who have died. Now, 90 percent of all congenital heart cases are cured."

Most cardiovascular treatments were obtained through research on a variety of animals, including rodents, dogs, cats, rabbits, and sheep. Scientists have used dogs to develop the pacemaker and surgical techniques used in coronary artery bypass surgery and heart transplantation. Rats are the most important model for researchers studying hypertension, because certain types of rats develop hypertension spontaneously. Research with rabbits has pointed to the relationship between genetics and blood pressure, and aided researchers in the study of stress-induced cardiomyopathy and atherosclerosis. Dr. DeBakey emphasized that current research in a permanent myocardial infarction in calves and pigs because the animals have cardiac systems that resemble those in humans. "The truth is that there are no satisfactory in vivo models at present for certain types of clinical research and testing," Dr. DeBakey said. "A computer is not a living system and could not alone have produced the dramatic medical advances of the past decades."

Cancer
In the early 1900s, few cancer patients had any hope of long-term survival. The disease was still a major killer, with an estimated 1,375 people a day dying of cancer in the United States. Due to treatments developed through animal research and testing, and the use of chemotherapy, four out of 10 cancer patients will still be alive five years after diagnosis. A decade ago many patients with cancers such as Hodgkin’s disease, Ewing’s sarcoma (a form of bone cancer), and lymphocytic leukemia had a poor prognosis. Today, most of those patients are cured.

Animal research led to the discoveries of most cancer treatments. Most of the first studies on chemotherapy were done with tumors in mice. Rats have played an important role in the treatment of breast cancer, due to similarities between human breast cancer and rodent mammary carcinoma. Rats have helped elucidate the characteristics of malignant tumors and which treatments work best. Scientists have extensively studied animals new therapies, such as interferon, interleukin-2 and other biologic response modifiers, which researchers hope will enhance the body’s own disease-fighting systems.

According to Dr. Heiner Fiebig, who conducted research for the National Cancer Institute (NCI), many animal models have had a major role in the testing of compounds to treat cancer. "Between 1935 and the mid-1970s, 40 promising compounds were identified using animal models," he said. "Animals have also had a very prominent role in the use of chemotherapy." Animal research helped NCI make significant strides in the areas of leukemia, lymphoma and testicular cancer. Dr. Fiebig noted.

Diabetes
Researchers Sir Frederick Bancroft and Charles Best used dogs in their experiments that eventually identified insulin as an important hormone in carbohydrate metabolism. Their work led to the discovery of insulin for diabetes in 1922.

Research with rodents is helping scientists understand the causes of diabetes, and in particular, insulin-dependent (juvenile) diabetes. A group of Stanford University Medical Center made significant strides in 1988 when it engineered an antibody that cured laboratory mice of diabetes. A year-long study demonstrated that a special monoclonal antibody could block the destructive action of a T-cell lymphocyte that is believed to help trigger diabetes. Researchers continue to be interested in studies of diabetes, including work on pancreatic transplants, and ocular and vascular complications associated with the disease. However, the number of dogs used in diabetes research is declining as the knowledge gained through earlier work allows researchers to use their techniques and models.

Alzheimer’s Disease
Current research on Alzheimer’s disease, a degenerative brain disorder affecting about 2.5 million Americans, has focused on both discovering its causes and potential treatments. Estimates show that one in 20 people over the age 65 and one in 5 people over age 85 has the disease.

Research on primates is of an important characteristic of the disease, which is the appearance of senile plaques, or clusters of nerve endings, in the cerebral cortex. A small number of elderly dogs has been studied because they often exhibit these senile plaques.

Researchers in California and Massachusetts have done studies with rats that may help avoid memory loss, a major effect of Alzheimer’s disease. Researchers discovered that it is possible to keep “memory-related” cells in the brain from dying by injecting the cells with nerve growth factor.

Research for the Benefit of Animals
Animals have also benefited from medical breakthroughs. Veterinarians use many techniques and treatments to save animals— including orthopedic surgery, pacemakers, transplants and radiation therapy.

Most drugs, diagnostic tests and surgical techniques used in veterinary medicine today come directly from research or from human medical or surgical practice that was originally based on animal research. Dr. DeBakey said at The DeBakey Heart Center at Baylor College of Medicine. “The discovery process is often worked out on animals with the specific intent of being used on people, and if it is successful, veterinarians often find it economically feasible to use the same techniques on animals. Hip replacements are a good example. Over 100,000 hip replacements are done in the U.S. each year, due to research first done on dogs. Now this technique is being used on dogs.”

Animal research has led to preventive treatments, including medications to kill parasites such as heartworm and hookworms that can infect pets. Drugs to ease animals’ pain to avoid rabies, feline leukemia, distemper and hepatitis. Research led to the development of a vaccine against parvovirus, a new disease that killed thousands of young dogs in the 1970s.

Approximately half of all pets over the age of 10 die from leukemia or bone, skin or breast cancer. However, new surgical techniques, radiation therapy, chemotherapy, cryosurgery and hyperthermia have helped many animals live longer.

Kidney failure, another cause of death in dogs and cats, is treatable with new micro-surgical techniques and organ transplants using the latest immunosuppressive drugs to prevent rejection.

Domestic animals, such as horses, cattle, sheep, hogs and chickens also benefit from research on breeding and nutrition. New vaccines helped protect against influenza and encephalomyelitis in horses, rinderpest in cattle, and gastroenteritis in pigs.

Biomedical research has also had a lasting effect on the discovery of new treatments, rehabilitation, nutrition, toxicology and medicine has helped save endangered species, such as the bald eagle, alligator, red wolf and Florida panther.

Significant Medical Advances Using Animal Models
Animals have played an integral role in the discovery of medical cures, treatments and vaccines. Since 1901, 77 Nobel Prizes in Physiology and Medicine have been awarded for research done with animals. The following is a sampling of some of the major medical breakthroughs that have been made using animal models.

Advances Using Animal Models

<table>
<thead>
<tr>
<th>Disease</th>
<th>Model</th>
<th>Description</th>
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<tr>
<td>Penicillin</td>
<td>Penicillin against bacterial infection</td>
<td>Mouse</td>
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<tr>
<td>Polio</td>
<td>Polio</td>
<td>Culture polyvirus in cells</td>
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<tr>
<td>Cancer</td>
<td>Cancer</td>
<td>Study of tumor and hormonal cancer treatments</td>
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<tr>
<td>Tuberculosis</td>
<td>Tuberculosis</td>
<td>Discovery of diagnostic potential and development</td>
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<tr>
<td>Heart Disease</td>
<td>Heart Disease</td>
<td>Study of disease</td>
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<tr>
<td>Aids Vaccines</td>
<td>Aids Vaccines</td>
<td>Development and safety testing</td>
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<td>Heart/Lung</td>
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<td>Development and testing</td>
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<td>Pacemaker</td>
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<td>Transplant</td>
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<td>Technique refinement</td>
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(Sources: JAMA, Perspectives in Biology & Medicine, Newsweek)

Reprinted with permission from "Portraits of a Partnership For the Remarkable Role of Research Animals & Man." Published by the Foundation for Biomedical Research through a grant from CIBA-GEIGY Pharmaceuticals.
Nation's First Animal Bloodmobile

The nation's first animal bloodmobile was put into service on November 7, 1991 at VHUP. The dedication ceremony was attended by donors, friends, faculty, staff, students and a number of canine blood donors.

The acquisition of the specially designed and equipped vehicle was made possible through generous contributions from the Bernice Barbour Foundation, Mr. and Mrs. John H. Remer, Jr., Mrs. Louise White, Devon Dog Show Association, Chester Valley Kennel Club, Dodge Industries, Inc., Mr. and Mrs. Peter Nero, Penn Ridge Kennel Club, Penn Treaty Kennel Club, Mr. Dan Buckley, Dr. Dan Bleicher, Neshaminy Valley Dog Club (in memory of Elizabeth Irwin), Ms. Nancy Martino, Southern New Jersey German Shepherd Dog Club, Delaware Valley German Shepherd Dog Club (in memory of Betty Jane Irwin), Berks County Dog Training Club, Inc., West Chester Obedience Club, Inc., Lower Bucks County Dog Training Club, Inc., Elizabeth Hayes, Bernese Mountain Dog Club of Watchung, Inc., Mrs. Saul Freedman (in memory of Martha S. Hayes).

Since November the vehicle and Donna Oakley, blood bank director, have "gone on the road" at least twice a week to collect blood from dogs at blood drives organized by individuals and dog clubs. The vehicle makes blood donation more convenient for dogs and their owners, said Donna Oakley, VHUP head nurse and blood bank director.

"The idea of people and their pets helping other people and their pets is what makes Penn's blood donor program so special," Oakley said. "The bloodmobile makes it easier for animals to participate, and increases the supply of blood that is so critical to saving animals' lives."

The blood donor program is an important part of Penn's veterinary transfusion medicine program, according to Dr. Urs Giger, associate professor of medicine and head of the program. "Transfusion medicine, a relatively new field in veterinary medicine, focuses on the safe and effective administration of blood and its components," he said. "During the past ten years, the number of transfusions has been increasing dramatically because of an increase in medical and surgical care available at VHUP."

The custom-made vehicle is equipped with a hydraulic-lift examining table with a built-in scale, blood testing and collecting equipment, and a bloodbank refrigerator for proper storage of the collected units of blood.

VHUP's blood donor program began in 1987 to meet the needs of the hospital's patients; more than 500 dogs are currently enrolled. Once an animal donates blood, it becomes a member of Penn's blood bank. The idea for the bloodmobile grew because many people wanted to participate in the program, but found it difficult to get to the hospital with their pets, Oakley said.

The hospital performs approximately five transfusions a day, a procedure that has increased the survival rate of critically ill animals. Of the nearly 500 animals that needed blood or blood products last year, about two-thirds survived and were discharged.

"It is vital to remember that very few of those animals would have survived if it hadn't been for the blood or blood products," Giger said. Canine donors must be one year old, weigh at least 50 pounds, be current on all vaccinations, and not on any medication other than heartworm preventative. A complete blood count and heartworm test are performed prior to donation. An eligible dog can safely donate one pint of blood every six weeks.

"During the procedure, which takes about five minutes, the dogs are relaxed and resting," Oakley said. Afterwards, donors are offered a tasty snack and fresh water, and the owners are given the dog's official blood donor card. The collected blood is tested for infectious agents, the bloodtype is determined, and the blood is separated into different blood components which will be used in transfusions.

"The bloodmobile not only increases our supply of blood, but also helps us to have on hand blood with different bloodtypes," Giger said.

Showed here with Dean Andrews are some of the donors who made the bloodmobile possible: Dan Buckley, Abington Police Department, Dean Andrews holding the plaque listing the donors, Mrs. Eve Lloyd Thompson, secretary and treasurer of the Bernice Barbour Foundation, Inc, Ms. Melanie Pease, Southern New Jersey German Shepherd Dog Club, and her dog Tiffany, a frequent donor, Mrs. Lilian Ostermiller, Bernese Mountain Dog Club of Watchung, Donna Oakley, blood bank director, and Dr. Urs Giger, associate professor of medicine and medical genetics.

Quintuplets

Five lambs were born to a two-year-old ewe at New Bolton Center. The lambs, four females at six pounds each and one male, at four pounds, and their dam were cared for in the Graham French Neonatal Intensive Care Unit for a few days. The ewe is part of the School's teaching flock.
VHUP Birthday

VHUP celebrated its 10th birthday in October, the original move-in took place between Oct. 5 and Oct. 19, 1981. To mark the occasion, two parties were held. On Oct. 10 donors and special friends joined the dean and school officials to celebrate 10 years of VHUP. On Oct. 23 the School, faculty, staff and students, took over the Marshak Gallery for a birthday party.

Since VHUP opened its doors in 1981, more than 100,000 animal patients have been cared for here. The following new services have been added since the hospital opened its doors: blood bank and bloodmobile, ultrasound, including color enhanced doppler unit, endoscopy, dental clinic, Center for Veterinary Critical Care, hip dysplasia clinic, and inherited eye disease clinic.

To celebrate the occasion several donors and veterinary associations made gifts to purchase a set of new cages for the Emergency Service. The donors were: Bucks-Montgomery Veterinary Medical Association, Bucks County Kennel Club, Dr. M. Josephine Deubler, Pennsylvania Veterinary Medical Association, Mr. Roger Rechler, Schuylkill Valley Veterinary Medical Association, Dr. and Mrs. Will Spear.

ICU Party

The Center for Veterinary Critical Care gave a party for Very Important Pets to mark the renovations of the Intensive Care Unit. Dr. Jeffrey Wortman presented the Veterinary Medical Alumni Society's first Honorary Alumni Award of Merit to Ray Thompson, executive director of the PVMA, and the first honorary alumnus of Penn's Veterinary School.

Dr. Jeffrey Wortman, associate professor of radiology and assistant dean for academic affairs, accepts the MSD AGVET Award for Creativity from Dr. Janice L. Nicol, Field Technical Services, MSD AGVET. The goal of the awards program, established in 1991 by MSD AGVET, is to motivate risk taking in the implementation of innovative approaches to veterinary medical education. Dr. Wortman received the award for his faculty development proposal for a program on teaching and testing methodologies.

SmithKline Beecham Animal Health Awards

Grant to School of Veterinary Medicine

SmithKline Beecham Animal Health, a leading provider of health products for livestock and companion animals, has awarded $100,000 to the School of Veterinary Medicine at the University of Pennsylvania. These funds, which will be disbursed over the next three calendar years, will be used to aid veterinarians who wish to further their education at the Ph.D. level. The grant will allow two students per year to complete all formal course work prior to a laboratory research assignment at the University's medical or veterinary schools.

Dr. Susan Westmoreland, a 1991 graduate of Penn, has been selected as the first year grant recipient. She is currently completing a rotating internship at the Veterinary Hospital of the University of Pennsylvania and will enter the Graduate Group of Pathology this fall.

"The School of Veterinary Medicine is extremely pleased with the grant from SmithKline Beecham Animal Health and appreciates their support of graduate education," said Jeffrey P. Roberts, associate dean for development and planning. "Not only will the grant assist individuals in commencing a Ph.D. program, it will also help to fill the need for veterinarians specializing in important scientific disciplines," he said.

Dr. Kotlikoff receives Award

Dr. Michael Kotlikoff, associate professor of pharmacology, was one of the winners of the 1991 Hildegar Doerkamp-Gerhard Zbinden Foundation Award. The award recognizes research scientists for their contribution to the refinement, reduction or replacement of animals in experimental studies. The 1991 award acknowledges landmark work in the development of non-whole animal methods for research on cardiopulmonary function and bronchial asthma.

The prize of DM 50,000 was split. A first prize of DM 15,000 was awarded to Dr. Anna M. Wobus, Institut für Genetik und Kulturpflanzenforschung, Gatersleben, Dr. Gerd Wallukat, Institut für Herz-Kreislaufforschung, Berlin, and Dr. Jürgen Hescheler, Institut für Pharmakologie, Berlin, for their work in engineering a line of mouse embryonic stem cells that differentiates into cardiomyocyte tissue which can be used to test responses to neurotransmitters and drugs.

Dr. Kotlikoff received a second prize of DM 15,000 for his work on the development of a human airway smooth muscle cell line and single-cell systems to study airway smooth muscle excitation/contraction coupling. The work has led to a fuller understanding of the inflammatory processes involved in asthma, and the cells have been used to study membrane ion channels and their cellular regulation.

While Dr. Kotlikoff's research was not designed specifically toward the development of alternatives to animal research, he accepted the award "as someone concerned with animal welfare, as well as the advancement of scientific knowledge."

The awards were presented in April at the 10th Anniversary Symposium of the Center for Alternatives to Animal Testing at Johns Hopkins School of Public Health, Baltimore, MD.
Dr. Peter Theran, V'61, vice president of the MSPCA's Health and Hospital Division, was named president of the Massachusetts Veterinary Medical Association.

Dr. Joseph Stoyak, V'52, was the recipient of the Massachusetts Veterinary Medical Association's Distinguished Services Award. Dr. Stoyak is chief-of-staff at the MSPCA's Angell Memorial Hospital.

Dr. Adrian Morrison, professor of anatomy, was awarded a Burroughs-Wellcome Visiting Professorship and Medal by the Royal Society of Medicine, London. While in England, he participated in a symposium, "Sleep and Rest in Man and Animals" at the Royal Society of Medicine, as well as the annual meeting of the Association of Veterinary Teachers and Research Workers in Scarborough. Dr. Morrison has been named to the Board of Trustees of Americans for Medical Progress and the National Animal Interest Alliance. Both organizations have been formed to educate the public about the responsible use of animals and the dangers posed to the public's health by the animal rights movement.

Dr. David Kritchevsky, Wistar Professor of Biochemistry, was Burroughs-Wellcome Visiting Professor in Nutrition at the University of Alabama School of Veterinary Medicine. Dr. Kritchevsky is the recipient of the 1992 Robert H. Herman Memorial Award, presented by the American Society of Clinical Nutrition for "sustained research efforts and achievements in clinical nutrition."

Dr. Wilbur Amund, V'66, adjunct associate professor of zoology, has been appointed to the Board of Directors of the American Association of Zoological Parks and Aquariums. At the general meeting of the World Association of Wildlife Veterinarians in August in Rio de Janeiro, Brazil, Dr. Amund was elected chairman of the WAW.

Dr. Urs Giger, associate professor of medical genetics, and his collaborators received the Shannon Award, a newly established award from NIH, for their studies on canine muscle phosphofructokinase deficiency, an inherited erythrocyte deficiency and metabolic myopathy in English springer spaniels. The Robert E. Winn Foundation awarded a research grant to Dr. Giger and Dr. Margaret Cess, resident in medical genetics, to study "Transfer of colostral antibodies to the neonatal kitten: prevention against infection and cause of neonatal stearoylcholestrolysis."

Dr. Kevin Stanley, assistant professor of dermatology, received the "Warm Fuzzy Award" from the four Philadelphia area veterinary medical associations. The award is presented annually to recognize excellent service to referring veterinarians and clients.

Dr. Mattie Hendrick, V'78, assistant professor of pathology, was awarded a research grant by the Robert H. Winn Foundation to study the "Etiology of vaccine induced sarcomas in the cat."

Dr. Edwin J. Andrews, V'67, has been invited to serve a four year term on the National Advisory Research Resource Council of the National Institutes of Health.

Janie Hayden, research specialist in the laboratory of pathology, took seventh place in the 1991 Nikon Small World Competition for his darkfield micrograph "Canine Epithelium with Compound Hair Follicles." The photo appeared in the 1992 Nikon Small World Calendar.

Dr. Leon Z. Saunders was honored with an International Symposium on The History and Science of Veterinary Pathology at the National Library of Medicine, Bethesda, MD in December.

Dr. Ralph L. Brinster, Richard King Mellon Professor of Reproductive Physiology, was awarded the 1992 Embryo Transfer Pioneer Award by Theriogenology, an international journal of animal reproduction.

Dr. William Brice, V'78, is a host on a weekly cable TV show, "Let's Talk Pets," broadcast in Chester County, PA.

Dr. E. Neil Moore, professor of physiology, has been re-appointed visiting professor of medicine in the Department of Medicine at Johns Hopkins University Medical School and reappointed as adjunct professor of medicine at Halheen University School of Medicine. Dr. Moore presented a paper and co-chaired the symposium at the 10th International Symposium on Frontiers of Arrhythmias held in Maralava, Italy. In the fall Dr. Moore presented a paper at a symposium on "Tachycardia Mechanism Management" sponsored by the Futura Medical Meetings. He co-chaired a two-day meeting on "New Drugs and Devices," and presented a paper at a seminar sponsored by the American College of Cardiology.

Dr. Peter J. Irlke, V'72, was made an Honorary Life Member of the Swedish Veterinary Dermatology Study Group and of the British Veterinary Dermatology Study Group. Dr. Irlke presented a paper at the World Small Animal Veterinary Association meeting in Vienna in October.

Dr. Narayan G. Avadhani, Harriet Ellison Woodward Professor of Biochemistry, has accepted to serve as member of the Physical Biochemistry Study Section, Division of Research Grants, at the National Institutes of Health, for a four-year term.

Dr. Daniel E. Vernon, V'59, has turned vintner. His winery in Oldwick, NJ produces between 14,000 gallons of wine a year.

Dr. Sydney Evans, V'77, assistant professor of radiology, was honored by the alumni association of Cook College of Rutgers University and awarded the George H. Cook Award during 1992 graduation ceremonies.

Dr. Harry Reynolds, V'56, was recognized at a reception during the 1991 annual meeting of the American College of Veterinary Pathologists for "sustained excellence in the teaching of veterinary pathology." The award, the first of its kind, was presented by the C. L. Davis Foundation for the Advancement of Veterinary Pathology. Dr. Reynolds retired in August 1991 after 32 years of service from the University of Illinois, College of Veterinary Medicine, where he was chair of pathology and assistant head of the Department of Veterinary Pathology.

New Bolton Center was well represented at the American Association of Equine Practitioners meeting in December. Papers were presented by Dr. Benson Martin, V'80, assistant professor of equine sports medicine, Dr. William Moyer, professor of equine sports medicine, Dr. David Nonnamaker, V'68, Jacques Jenny Professor of Orthopedic Surgery, Dr. Virginia Reef, associate professor of medicine, Dr. Michael Ross, assistant professor of surgery, and Mr. Robert Sigafous, farrier.

Dr. Robert Eckroade, associate professor of poultry pathology, and Dr. Charles Benson, associate professor of microbiology, presented papers at the Symposium on the Diagnosis and Control of Salmonella, sponsored by the United States Animal Health Association and the American Association of Veterinary Laboratory Diagnosticians, in October in San Diego, CA. Dr. Max Van Beskirk, Jr., V'56, was a program moderator at the event.

Dr. M. Phyllis Lose, V'57, has revised and updated her book, Blessed are the Broadmianes. The second edition is published by Howell Book House.

Dr. John E. Martin, V'42, received the PVMA's Distinguished Public Service Award for his roles as "educator, author, editor, researcher, historian and friend... in a career that has spanned 50 years."

The organization's 1991 Public Service Award of Merit was presented to Dr. Henry L. Croft, V'78, for his "outstanding achievements in working with young people to encourage respect and responsibility for nature, animals and the environment."

Dr. John Cable, V'56, and Dr. Joseph O. Simington, V'43, were elected to corresponding (life) status in the PVMA.

Mr. Charles S. Wolf, chairman-emeritus of the School's Board of Overseers was elected to honorary membership of the PVMA.

Dr. Edward Dionne, V'68, is a volunteer for the Heifer Project International. In September he accompanied 88 heifers and six bulls to Egypt to ensure that they were transported safely. Heifer Project International, based in Little Rock, AR, tries to eliminate hunger worldwide by sending farm animals, cows, pigs, chickens, goats and even bees, to small villages in the Third World.

Elizabeth K. Stanley, V'93, was one of 26 students from around the country selected to participate in the Pfizer Animal Health Student Representative Program. The program provides one student from each U.S. veterinary school with the opportunity to plan and implement selected educational activities tailored to complement the veterinary school curriculum and to increase exposure to the principles of veterinary pharmacology and therapeutics.

Dr. Jeffrey M. Ott, V'77, was elected president of the Pennsylvania Veterinary Medical Association.
At the July 1991 American Veterinary Medical Association meeting in Seattle, WA, the Association of American Veterinary Medical Colleges (AAVMC) celebrated its 25th anniversary with a banquet.

Pictured are Dr. Joseph Alexander (left), immediate past president of the AAVMC, receiving a historic ceremonial gavel from Dr. Edwin J. Andrews, president of the Association.

The gavel was presented as a gift from the School of Veterinary Medicine to the Association on the occasion of the 25th anniversary. The gavel was crafted from Pennsylvania walnut by Dr. Mark Allam, former dean of the School and the first president of the AAVMC. The plaque in the background lists all the AAVMC presidents and hangs, along with the gavel, in the Association's offices in Washington, DC. Dr. Andrews serves as president of the Association through the 1991-92 academic year.

Correction

In Bellwether 31 we incorrectly identified Dr. Katherine A. Houp, V'63, as Dr. Katherine A. Hopkins. Dr. Houp is the author of Domestic Animal Behavior, recently published in its second edition. She is a professor of physiology at New York State College of Veterinary Medicine, Cornell University. We regret the error.
Llamas
In recent years, llama raising has become a multimillion dollar industry. Western Hemisphere camels include the alpaca, guanaco, vicuna and llama, and in the Eastern Hemisphere there are the dromedary and bacterian camels. Llamas are raised for use as pack animals and as companion animals. Their wool may be of value but they need several years to grow back a new coat. In the American West, they are being used as watch animals for sheep. They are aggressive toward coyotes and many shepherds say they are more effective than dogs, guns, electric fences, and chemical repellents.

Llamas may sell for $5,000 to over $50,000 or even more. The stud fee for a male can be as much as $1,500. Most llama farms are in the West but it is said that there are about 100 farms in Pennsylvania. Four to six llamas can live comfortably on the same acreage as a single horse. They eat chow in the winter months and hay and grass in the warm weather. Their thick wool helps the llamas in cold weather but can make them uncomfortable in the summer. Births almost always take place in the fall and spring, avoiding very hot and cold weather. The gestation period is about a year and delivery almost always comes about noon.

Llama trekking is popular in the West. They are not built for riding (they weigh 300 to 400 pounds) but as an alternative to back packing, they transport supplies for camping trips to high country. Llamas have keen eyesight and hearing and often alert their human companions to wildlife along the trail. They are remarkably quiet and gentle animals, domesticated thousands of years ago in South America for use as a pack animal.

Before you decide on any exotic animal as a pet, investigate! Be sure you know what is required and what you can expect. Many people want something different but cannot cope after a few months. In the language of the Incas, llama is pronounced "yama," the pronunciation sometimes used instead of "llama." However you say it, do some studying before you try to make a fortune with llamas.

Campylobacteriosis

Campylobacter species are one of the causes of gastroenteritis in man and animals, including dogs and cats. It is worldwide in distribution and the incidence appears to be increasing. However, this could be because special culture techniques are required, and the special media now are available commercially.

Clinical signs of campylobacteriosis are non-specific and typical of any acute gastroenteritis (severe diarrhea sometimes with vomiting). The most severely affected are young, debilitated or immunocompromised animals. The treatment includes fluids and antibiotics. In some cases, there may be chronic, recurrent infections.

There is some controversy over the importance of Campylobacter infections because the organism may be isolated from normal and diarrheic animals. It may be considered an opportunistic pathogen and can be a problem in crowded, unsanitary quarters.

There is possibility of transmission from pets to humans and severely affected animals should be handled carefully.

Artificial Insemination

The use of frozen or fresh extended semen is becoming quite common. The semen may be shipped overnight for artificial insemination rather than shipping any of the dogs involved. The conception rate is about 75% which compares favorably to natural breedings.

Regardless of the breeding method used, proper ovulation timing is crucial. Special kits for progesterone testing are commercially available for use by veterinarians, along with vaginal smears, to determine correct time for insemination.

Recently, the American Kennel Club has approved the use of imported semen from any country whose stud book is recognized by the AKC. There are special requirements, including pre-approval. The extraction, storage, shipping and insemination must be done under veterinary supervision. For some time, American frozen semen has been shipped abroad with successful results.

There are a number of semen freezing centers in this country as well as some in Australia, New Zealand and France.

Popular Dog Breeds

In 1991, the American Kennel Club registered 1,379,544 dogs. The Labrador retrievers were in first place, becoming the sixth breed to head the list in the last 65 years. The German shepherd was most popular 1926-29, the Boston terrier from 1929-35, the cocker spaniel from 1936-1952 and from 1953-1959, and the poodle from 1960-1912.

Following the Labradors in the "Top Ten" were poodle spaniels, poodles, Rottweilers, German shepherd dogs, golden retrievers, beagles, dachshunds, chow chows and Shetland sheepdogs.

There were 134 breeds on the 1991 list. Three breeds were added - Australian shepherds, Chinese crested and miniature bull terriers. There are 146 breeds and varieties competing at championship shows. For show purposes, the American Kennel Club designates varieties in nine breeds. Cockerspaniel is black, ASCOB (all solid colors other than black) and parti-color; bull terriers are colored or white; English toy spaniels are King Charles and Ruby (solid-colored) and Blenheim and Prince Charles (broken-colored). Three breeds are divided by coat - dachshunds are long-haired, smooth and wirehaired, while collies are rough or smooth and Chihuahuas are smooth coat or long coat. Size divides the other three breeds - beagles are not exceeding 13 in. and 13 in. but not exceeding 15 in., poodles are toy, miniature and standard and Manchester terriers are standard and toy. The standards for the breeds give a complete description of the varieties.

Many breeds of dogs are recognized in different countries and by other registries in the United States. The American Kennel Club is the principal agency for registration of pure-bred dogs in this country. It is an independent, non-profit organization which lets its officers include public education on responsible dog ownership. In 1991, there were 1,143 Dog Shows held under American Kennel Club rules.

Book Reviews

The Complete Cat Book by Richard H. Gebhardt (Howell Book House, $9.95 paperback)

Cats have surpassed dogs as the most popular pets in America. This book gives expert advice on every aspect of buying, owning and caring for a cat.

A chart gives evaluations of activity level and grooming needs—high, medium or low. Of the 44 breeds listed, 16 may produce kittens which are not showable. Nine breeds have genetic concerns—susceptibility to kidney problems in Abyssinians and spinal problems in the Devon Rex. The cat fancy in the United States was officially born in 1895 when a cat show was held in Madison Square Garden in New York. It is probable that cats were fully domesticated in Egypt by 1600 B.C. In 1990, the six North American registries sponsored 824 shows. The largest breed is the Rottweiler and the smallest is the Siamese. There are only four breeds that are not recognized by the American Kennel Club.

About the origin of the Devon Rex, we read "In 1960 a kitten with wavy hair was discovered in a litter of straight-coated feral kittens in Devonshire, England. The father of this litter was believed to have been a tomcat with a similar wavy coat who lived in an abandoned tin mine near Buckfastleigh in Devonshire. The mother of the litter was a torrie-andwhite normal-coated strain that raised her kittens in a field...."

The Siamese is well over two centuries old, and perhaps a good deal older. The Persian is the most prized and plentiful of all pedigreed cats. They are recognized in nearly fifty colors and patterns. It was introduced to Europe by an Italian traveler more than 350 years ago.

Three important questions are answered. Your cat should be neutered unless purchased for breeding. A cat is best kept indoors. Do not declaw if this can be avoided.

There are chapters on Care and Housekeeping, Reproduction, Nutrition, Sex and Socialization. The book contains an excellent glossary, information on cat registries, a bibliography, as well as a list of feline health and welfare organizations is included.

This book is an authoritative reference and may well be called "America's Official Cat Book."

American Kennel Club Dog Caring and Training (Howell Book House, $9.95 paperback)

This is a basic reference book that tells you what to consider before getting a dog, how to train and care for a puppy, travelling with or boarding your dog. It gives you advice on grooming, nutrition, exercise, obedience, training, and much more. It is probably the most complete, comprehensive guide to dog care available, and it is recommended for anyone who wants to own a dog.

"Look beyond the enchanting puppy before you buy, and try to envision what a year's worth of growth will deliver: a perfect fit or potential problem?"

Several pages of excellent drawings give a lesson in anatomy and structural faults. There are a glossary and bibliography. Information on different competitions - dog shows, obedience trials, field trials, hunting trials, tracking tests and herding programs - explains these activities.

This is a good book to read before you bring your first dog home and one that answers many questions for the novice and more experienced owner.
**Puppy Problem Prevention Class**

Beginning in September 1992 the Behavior Clinic at VHUP will reinitate its Puppy Problem Prevention Class. Started in the Spring of 1992 with a trial run, it will now be given weekly since it was such a resounding success. The Puppy Problem Prevention Class is not an obedience class; it is a single two-hour session that focuses on normal behavior and the importance of early socialization. During the session clients learn appropriate verbal and physical techniques to correct puppies and how to teach them desired behaviors. Puppies interact with each other in play as a way of illustrating appropriate behaviors and techniques to owners. Additionally, vaccination schedules, heartworm prophylaxis, intestinal parasitism, diet, exercise, neutering, breeding, and general health concerns are discussed. Clients are provided with handout packages that emphasize the goals of the class. The visit costs only $25. It includes a complete physical exam, and occurs in groups of no more than six puppies. Preference is given to puppies six months of age and under. Appointments are scheduled on Saturday mornings and can be made by calling 215-898-3347.

As an offshoot of the Puppy Problem Prevention Class the Behavior Clinic at VHUP has received a grant from Miles Laboratories to investigate the extent to which early intervention prevents future behavior problems. 150-200 puppies six months of age or under, are being actively solicited for this study. Puppies will be followed for at least a year. The first appointment will be a standard Puppy Problem Prevention Class; thereafter, re-exam appointments will be scheduled every three months. Clients will be asked to complete a questionnaire about their puppy's behavior prior to the first appointment. This same questionnaire will be completed at three-month intervals during re-exams. All puppies will be videotaped while being asked to perform specific behaviors separately and in groups during all exams.

Some puppies will be fitted with PROMISE System canine head halters without cost to the client. Clients will complete a weekly one page diary of puppy activities and will discuss any questions they might have with an assistant in the clinic on a weekly basis. There is an initial $25 fee for the first class; however, clients choosing to participate in the study will receive the following free of charge: DHLPP and rabies vaccines for the duration of the study (including any incomplete puppy vaccines), twice yearly fecals and appropriate medications, and annual heartworm tests. Initial appointments are 2 hours and are on Saturdays. Follow-up appointments are 1/2-1 hour and are usually on Saturdays, but can be at other times to accommodate clients schedules. Referring veterinarians will receive periodic updates on patient's progress. For information and/or to schedule an appointment, please call 215-898-3679.

**Computer Model to Assist Residue Avoidance**

Drug residues in food products are a concern that producers and consumers share. Antibiotics must occasionally be given to food producing animals to treat an illness or prevent disease from occurring. After treatment, these animals must be with-held from market for a number of days to permit excretion of all remaining drugs from the body, thus preventing residues in meat or milk when the animals is marketed. The with-holding time depends on the species of animal, the antimicrobial drug used, the dosage, and the duration of treatment. The proper with-holding time as determined by the company marketing the drug is displayed on the drug label; however, it is specific for one given dosage rate and duration of treatment. Occasionally, veterinarians must prescribe a higher dose or longer duration of treatment, and in those cases with-holding time is often based on an educated guess and premarket testing samples.

Now researchers at the University of Pennsylvania School of Veterinary Medicine, under the direction of Dr. Raymond Sweeney, have developed a computer model that can accurately predict the levels of antimicrobial residues in hogs. Given the dosage and duration of treatment, the model can calculate when drug residues will disappear from the animal. The model was developed for sulfamethazine, a frequently used antimicrobial in hogs, and with further studies may be extended to other drugs in hogs and dairy cattle. This research is supported by the Pennsylvania Department of Agriculture.

This model could prove to be a valuable tool not only for livestock farmers and veterinarians, but also to regulatory agencies and drug development companies that determine the proper with-holding times for antimicrobials.

**Penn Annual Conference**

The 1992 Penn Annual Conference was a great success and we offer our thanks to the 750 veterinarian, 155 technicians and 80 exhibitors who attended. A special thanks to the following exhibitors who sponsored lectures at the Conference:

- **A.J. Buck and Son**
- **DVM Pharmaceuticals, Inc.**
- **Peterson Imaging, Inc.**
- **The IAMS Company**

The 1993 Penn Annual Conference will be held at the newly-renovated Adam's Mark Hotel on Wednesday, January 20 and Thursday, January 21, 1993. We hope to see you there.


**Scholarships**

Susan Bauman, V'95, has been named Hill's Pet Products Dean's Scholar. Joseph K. Gaydos, V'94, has received the Lois F. Fairchild Scholarship in Veterinary Public Service. The Berks County Kennel Club awarded a scholarship to John Mrsic, V'92. The recipient of a scholarship from the Mid Sussex Kennel Club is Catherine Micek, V'92.

Linda A. Casper, V'92 is the recipient of the Dr. Samuel Schady Memorial Scholarship. Dr. Steven D. McGough is the recipient of the Edward McOough Dean's Scholarship in his name. The Pocono Mountain Kennel Club awarded a scholarship to Bruce J. Hein Deiss, V'92.

The William Goldman Foundations awarded the following scholarships: Carol Bellwether, V'93 was awarded the Dr. Kenneth J. Cullen Memorial Scholarship, and we invite you to make this gift in the name of your loved one.

**John T. McGrath, V'43**

Dr. John T. McGrath, emeritus professor of pathology at the University of Pennsylvania School of Veterinary Medicine, died Oct. 10, 1991. A world-renowned veterinary pathologist, Dr. McGrath served on the Veterinary School's faculty for 41 years. He was acting chairman of the department of veterinary pathology later of pathology from 1958 to 1961 when he was appointed chairman. He served in that capacity until 1963.

Dr. McGrath received his veterinary degree from Pennsylvania State University. He then served as captain in the Army Veterinary Corps until 1946. The following year he joined the School's faculty. In 1953 he received his board certification by the American College of Veterinary Pathologists. Dr. McGrath's research interests included effects of anesthetic agents in humans and he wrote the textbook *Neurological Examination of the Dog*, a standard for examination and diagnosis of neurological disease in animals. In addition, he published nearly fifty papers in journals and contributed chapters to other textbooks.

During his long and distinguished career, Dr. McGrath received many honors. In 1961 he was selected Veterinarian of the Year by the American Veterinary Medical Association and in 1966 he received the same honor from the American Animal Hospital Association. In 1967 he was the recipient of the Norden Teaching Award. In 1969, in recognition of his outstanding contributions to neuropathology, he was awarded an honorary veterinary degree by the School of Veterinary Medicine, University of Turin, Italy, and in 1974 he received the Klobousk Medal from the School of Veterinary Medicine, Brno, Czechoslovakia. The Pennsylvania Veterinary Medical Association presented him his Distinguished Veterinarian Award in 1988.

Dr. McGrath was an accomplished musician, played the saxophone and the clarinet. As a young man he performed with his father's band in Wildwood and the Willow Grove amusement park. While attending veterinary school, he performed with a band at a dance hall on Walnut Street and studied his veterinary notes, taken on the back of sheet music, during intermissions. Many here at the School remember his playing at parties and get-togethers.

Dr. McGrath was a member of local and national science fairs and taught nationally and abroad. He served as a consulting veterinarian for companies such as DuPont, Merck, and SmithKline. He was a member of the AVMA, PVMA, World Federation of Neurology, International Academy of Pathologists, and the Philadelphia Neurology and Pathology Societies.

Dr. McGrath is survived by his wife, Elva C.; sons Thomas and Robert; and grandchildren.

Memorial contributions can be made to the John T. McGrath Scholarship Fund, care of the University of Pennsylvania School of Veterinary Medicine.
Student Government Teaching Awards

On April 11, 1992 the Student Government held the Annual Teaching Awards Dinner Dance at the Adam’s Mark Hotel. The Class of 1995 presented its teaching award to Dr. Trudy Van Houten, visiting lecturer. Dr. Deborah Gillette, assistant professor of pathology, received the award from the Class of 1994. The Class of 1993 presented its award to Dr. Regina Oristaglio, resident in reproduction. The graduating class presented four awards for teaching. The recipient of the faculty member award was Dr. Richard Squires, lecturer in medicine; Dr. Marjan Govers and Dr. Marc Elie received the resident awards; Dr. Kirk Hassinger received the intern award, and Jane Cohen received the technician award.

In addition to the Student Government Awards, a number of other awards were presented. Dr. Raymond Sweeney, assistant professor of medicine, received the Norden Distinguished Teacher Award. The Beecham Research Award was presented to Dr. Michael Atchison, assistant professor of biochemistry. Dr. Monika Griot-Wenk, intern, received the Dr. Jules Silver Bedside Manner Award. The Iams Small Animal Clinician Award was presented to Dr. Marjan Govers and Dr. Carlos Mongil, resident in surgery. The William B. Boucher Award for Outstanding Teaching at New Bolton Center by a House Officer was presented to Dr. Elizabeth Laws, resident in surgery. Dr. David Diefenderfer, consultant in surgery, received the Residents’ Award for Outstanding Teaching by a Faculty Member.