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## 24th Annual Canine Symposium: Your Veterinarian and Your Dog

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# 24th Annual Canine Symposium

The 24th consecutive edition of the Canine Symposium "Your Veterinarian and Your Dog" was held on January 29, 1994 at VHIP. Following are summaries of the faculty presentations.



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## Canine Reproduction

Understanding the physiology of reproduction is the first step in ensuring the health of breeding bitches and their offspring. Dr. Margret L. Casal, medical genetics and pediatrics resident at the School, described normal canine reproductive cycles and abnormalities affecting fertility, pregnancy and parturition, and she presented some basic principles of sound breeding management in dogs.

At about 6-12 months of age, small to middle-sized male dogs reach puberty and bitches experience their first heat cycle; small to middle-sized bitches cycle every 6-8 months throughout life.

Proestrus in the bitch lasts seven to nine days and is marked by rising estrogen levels and bloody vaginal discharge. During the nine day estrus (heat) phase which follows, estrogen levels peak, vaginal discharge appears slightly watery and the bitch allows mating.

"The easiest way to determine that the dog is in heat is to follow its behavior," said Dr. Casal, "but not all dogs act like they're in heat, so it is important to use other methods too."

Dr. Casal recommended combining progesterone assays with vaginal smears to pinpoint the optimal time for breeding. As the estrogen prepares the ova for ovulation and the uterus for pregnancy, luteinizing hormone (LH) begins to rise. Progesterone levels begin their ascent, and ovulation occurs about two days after the LH surge. Progesterone, which maintains the pregnancy, remains elevated throughout the next stage, diestrus,

and then falls during the quiescent anestrus phase.

Before mating dogs, said Dr. Casal, it is important to assess their breeding suitability. Male dogs and bitches should come from thrifty litters and from a bitch who has cycled regularly and experienced no problems during parturition and whelping. Fit breeding dogs show no signs of genetic defects and test negative for the bacterial infection, brucellosis. Male dogs should undergo semen evaluation prior to breeding.

Pregnancy, accompanied by a fall in estrogen and a rise in progesterone, can often be detected by palpation as early as day 18. After about day 24, ultrasound can be used to monitor fetal heart rate and growth.

Gestation generally lasts 58-72 days and, about one week before parturition, the bitch's temperature, normally 101.5 degrees, starts to drop. A sudden plunge in temperature to as low as 95 degrees typically occurs 12-24 hours before birth. Dr. Casal recommended measuring the bitch's temperature regularly, beginning about two weeks before the expected due date and monitoring behavioral signs, which may include restlessness, appetite loss and nesting. The first puppy is normally born three to six hours after labor begins, with a 30-60 minute interval between puppies.

Fertility in the male dog and the bitch may be impaired by chromosomal aberrations, abnormalities in sexual development, malnutrition, obesity,

hypothyroidism, autoimmune diseases and infections of the reproductive organs. Both brucellosis and canine herpes virus may be sexually transmitted and can mar fertility in dogs; neither shows obvious clinical signs and both can lead to spontaneous abortions.

Tumors in sex organs, persistent frenulum and testicular torsion may diminish fertility in the male dog, as can ovarian cysts, pyometra and vaginal hyperplasia in the bitch.

Abortion and abnormal fetal development may result from trauma, vaccinations and certain medications given during pregnancy, as well as from spontaneous drops in progesterone.

Dysfunctional hormone systems of either the bitch or the puppies can obstruct the normal cascade of events which induces labor. One of the most common birthing problems, said Dr. Casal, is uterine inertia, a condition in which the uterus fails to contract; it may be caused by calcium deficiency, hypoglycemia, large litter size and acute fatigue. The presence of oversized, malformed and dead fetuses may also interrupt parturition.

Multiple factors play a role in successful breeding, said Dr. Casal, and veterinary attention should be sought if problems develop during mating, pregnancy or birthing. "Many of the causes of infertility and problems during birth can be avoided with proper management." ■

J.C.

## Genetic Diseases in the Dog

Sometimes you take the bad with the good. That's especially true with purebred dogs, said Dr. Peter Jczyk, adjunct associate professor of medical genetics at the School. Preserving cherished conformation, behavior and athletic traits in dogs often means selecting inadvertently for genetic abnormalities. Fortunately, significant advancements in the diagnosis and management of canine genetic diseases are well under way, and will enable breeders to identify sound stock. Dr. Jczyk discussed the manifestations, diagnostic methods - including metabolic screening, and therapeutic schemes relevant to several types of heritable disorders in dogs.

Whether genetic defects result from numerical alterations or structural rearrangements in the genome, their clinical effects are usually far-reaching within affected individuals.

"Chromosomal aberrations generally are those types of diseases in which there are widespread anomalies and a number of systems are affected," said Dr. Jczyk.

Congenital hypothyroidism, seen in boxers, Scottish deerhounds and giant schnauzers, manifests itself through abnormal facial and body structure, obesity, coat dullness and mental torpor. "Thyroid hormone has a great affect on brain development," Dr. Jczyk said, "and the dullness that these animals show is, in fact, due to the lack of thyroid hormone being synthesized."

Canine hypothyroidism, which may also occur secondary to such diseases as hyperadrenocorticism, is highly treatable through thyroid replacement therapy. These animals should not be bred.

Many toy breeds, particularly Chihuahuas, have suffered from their own popularity. Hydrocephalus, a condition characterized by enlargement of the cranium caused by abnormal accumulation of cerebrospinal fluid within the cerebral ventricular system, is on the rise in toy breeds. Clinical signs include a large, dome-shaped head, flattened face, open fontanel, laterally-directed eye sockets and hypermetria (over-reaching) in the front legs.

"My theory," said Dr. Jczyk, "is

that this is part and parcel of breeding toy dogs. We've actually changed the structure of their cranial bones.

"If it were not genetic, you would see it with the same frequency throughout all breeds. When you see reports from other places around the world of identical conditions, not only does it reinforce that it is, in fact, a genetic condition, but it also gives you some idea of how widespread it is in the population."

Determining that a disease is genetic is only half the battle; mapping its mode of inheritance is the other half. Most genetic diseases are inherited as autosomal recessive traits. Affected individuals of both genders have two defective genes as a result of matings of parents who may or may not phenotypically - or clinically - manifest the disorder. Genetic defects may also result from anomalies on sex chromosomes.

Dr. Jczyk described a study at Penn which examined familial immune deficiency in basset hounds. Since abnormal pups were males who died by four months of age, the researchers concluded that the disease is X-linked and transmitted through heterozygous (1 normal gene, 1 abnormal gene) mothers.

Short-limbed dwarfism, observed in Samoyeds and Labrador retrievers, presents a more complicated scenario. Afflicted dogs typically have shortened, bowed forelimbs, and retinal folds. In a recent study at the School, a breeding of two affected individuals produced eight offspring - four normal pups and four short-limbed dwarfs, only two of which had retinal folds.

Researchers determined the probable mode of transmission to be autosomal dominance with incomplete penetrance, which would explain why individuals with the defective genes were not all affected to the same degree.

"With some of these diseases, it's not so obvious how they're inherited," said Dr. Jczyk. "Until we get better diagnostic methods, we can only make inferences about their mode of inheritance from pedigree analyses."

Canine genetic research presents a unique challenge because dogs' chromo-

somes are not very distinct. "They're a lot harder to sort out, and there's still no good consensus as to numbering chromosomes in dogs," he said.

And while unanswered questions still shroud many of the polygenic disorders - which result from mutations on more than one gene - molecular testing is rapidly being refined for other genetic conditions.

Diagnostic innovations are also being applied to familial metabolic disorders. Clinical manifestations of inborn errors of metabolism in domestic animals typically include growth retardation, facial dysmorphism, skeletal malformations, organomegaly, ocular lesions and neurologic abnormalities.

Type II tyrosinemia, seen rarely in dogs, is manifested by dermatitis, lacklustre hair coat, ulcerated mouth and pads, and ocular tyrosine crystals. It is caused by a deficiency of tyrosine aminotransferase, the enzyme responsible for breaking down tyrosine in the blood.

"Showing this enzyme deficiency is enough to define it as a genetic disease," said Dr. Jczyk.

He added that access to comprehensive growth records is also key. "Growth information is one of the most important factors in diagnosing genetic diseases."

Methylmalonic aciduria, seen in young giant schnauzers, is characterized by growth retardation and general failure to thrive. To diagnose the disease, urine specimens are tested for the presence of methylmalonic acid, an intermediate in cholesterol breakdown. The mechanism for the blockage in the pathway usually involves some defect in the production, transportation or breakdown of vitamin B12. By administering large doses of parenteral B12, methylmalonic acid production has been shown to decrease.

While clinical identification of a genetic abnormality might help an affected individual, it contributes little toward eradicating the disease in the population.

"One of the important things we're doing is working to eliminate the carriers," Dr. Jczyk said. "But we can't

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## Genetic Diseases

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always tell if an animal is a carrier with an enzyme assay."

The first molecular genetic screening test for a common inherited disease in companion animals has been developed at the School. This routine test uses a genetic probe to identify mutant alleles and recognizes not only affected dogs, but also carriers of phosphofructokinase (PFK) deficiency. Identified in over 50 English springer spaniels, the disorder is inherited as an autosomal recessive trait. Affected dogs, lacking in this important glycolytic enzyme, produce dark urine subsequent to exercise or other physical stress.

Many heritable metabolic diseases, particularly those involving amino acid deficiencies, are treatable with dietary supplements. It is therefore important to identify them early. With gene therapy on the horizon and new genetic probes in various stages of development, we may soon rely on molecular genetics to diagnose and treat genetic diseases, as well as to screen the breeding population to remove carriers from the gene pool.

With financial support from the American Kennel Club (AKC), the Section of Medical Genetics at the School is completing work on the Canine Genetic Disease Information System, a listing of more than 200 canine genetic diseases, their symptoms and modes of inheritance, test and treatment information, and breed prevalence. The system will be available on computer discs in the near future. ■

J.C.



## Making Sense of the Pet Food Explosion

There's one word that sums up today's dog food arena, and that's *variety*. With over 15,000 products on the market, the consumer faces quite a dilemma in the supermarket pet food aisle. Dr. Kathryn E. Michel, post-doctoral fellow in nutrition at the School, discussed canine nutritional requirements and made recommendations about reading pet food labels, discerning fact from fiction in some popular marketing concepts and choosing quality foods that suit each dog's nutritional needs.

The six basic classes of nutrients - carbohydrates, protein, fats, vitamins, minerals and water - must be fed in optimal quantities to prevent problems associated with nutrient deficiencies and toxicities.

"These nutrients have to be available in the right amounts," said Dr. Michel. "There's no single exact quantity of any given nutrient that a dog needs every day; rather, there is a broad range. This range can, however, become narrow in certain circumstances...a dog that is sick, a pregnant bitch or a growing pup."

Both the state and federal governments regulate the pet food industry. The Food and Drug Administration controls therapeutic claims of manufacturers, and the states - through guidelines established by the Association of American Feed Control Officials (AAFCO) - oversee product nomenclature, label format, ingredients, guarantees, manufacturing practices and other factors relating to pet food quality.

Nutrition profiles now reflect nutrient availability. "Available" nutrients, differentiated from "fed" nutrients, are those which an animal may readily assimilate; this distinction is important because other food components, like starch, fiber and calcium, may alter the availability of nutrients by interfering with their digestibility and absorbability.

Pet food marketers capitalize on things like flavor varieties, nutrient content and the recent appeal of all-natural products, and the consumer who bases product selection on marketing concepts must be somewhat discriminating, said Dr. Michel.

"You've got to decide if (a market-

ing claim) is based on a scientific concept or if it's a gimmick to get you to buy the food."

Knowledge of how to read pet food labels can be a valuable tool in choosing products. The principal display panel includes the product identity, which is highly regulated. If a product is designated as "chicken," it must contain at least 70 percent chicken. The presence of a modifier (ie. "chicken platter") indicates that the product is at least 10 percent chicken. "Chicken flavor" merely means that the chicken taste is evident in the food. Other components of the principal display panel include pictorial representation, net weight and manufacturer's name.

The information panel features the nutrition statement, based on either adherence to AAFCO nutrient profiles or results of feeding trials, and a statement of that basis. Also included here are the ingredients, listed in descending order by weight.

The guaranteed analysis includes, by percentage, minimum crude protein and fat, and maximum moisture, ash and crude fiber. To obtain the percent carbohydrates, subtract the listed percentages from 100. Compute the total calories from nutrient classes by multiplying the percent protein and carbohydrates by 3.5 kcals/gram and the percent fat by 8.5 kcals/gram; the sum of the three equals the total calories in 100 grams of the food. To figure out the percent protein on an energy basis, divide the total calories from protein per 100 grams by the total calories per 100 grams. Do the same for fat and carbohydrates.

Dogs' nutritional requirements differ from those of human beings. Ensuring their proper nourishment means not only understanding their individual nutritional needs, but also reading between the lines when evaluating dog foods. ■

J.C.

## Canine Emergencies

Dogs can be victims of their environments and prey to their own curiosity. Fortunately, aggressive emergency therapies exist to manage many of their medical crises. Dr. Kenneth J. Drobatz, assistant professor of emergency medicine and director of VHUP's 24-hour Emergency Service, cited some of the common causes of canine emergencies, their mechanisms, treatments and prognoses.

Dogs brought to the Emergency Service are treated on a triage, or medical priority, basis: those with life-threatening conditions are treated before stable patients. Clinicians immediately treat distress in the four major physiological systems - the respiratory, cardiovascular, renal and central nervous system - which may mean deferring treatment of primary clinical signs.

"A dog could come in with a severed leg barely hanging by its skin. That's probably not its most life-threatening problem," said Dr. Drobatz. "The most life-threatening problem is probably the blood loss that has already occurred... If we can stabilize these patients, we can usually save them."

Mucous membranes are evaluated to assess blood oxygenation, and an intravenous (I.V.) catheter is inserted to allow immediate access to the dog's vascular system, should it become necessary to administer emergency drugs or measure blood levels.

A common canine emergency seen with some frequency in larger breeds is gastric dilation and associated volvulus (gastric/intestinal torsion). These patients usually present with abdominal pain and distension caused by gas accumulation. Other signs include retching, restlessness and rapid respiratory rate. Patients are given I.V. fluids, and then the stomach is decompressed, the volvulus is surgically corrected and any necrotic stomach wall is removed. Dr. Drobatz estimates the success rate for these procedures to be between 80-90 percent.

Not always so curable, but quite common - particularly in urban areas - are traumatic injuries. Gunshot wounds and injuries caused by automobiles are treated quite frequently at VHUP. Bite wounds, also seen often in dogs, may

offer a deceptive appearance: cutaneous punctures and lesions can downplay the severity of the muscle maceration and tissue necrosis underneath. These wounds must be drained and cleaned thoroughly to prevent abscess formation.

"Any trauma case, no matter how relatively benign it appears, needs to be treated with respect," said Dr. Drobatz. "We monitor the dog for at least 24 hours, the dynamic period. If something is going to happen, it usually happens during this time."

The Emergency Service frequently treats dogs for problems associated with toxin ingestion. Rodenticides with blood anticoagulants seem to be canine delicacies. Dogs that consume rodenticides - or rat poisons - usually present with acute hemorrhage, which may appear as swelling or bruising. Other clinical signs include anemia, tachycardia (increased heart rate) and respiratory distress.

Some of these patients may require intravenous fluid and blood products as well as thoracocentesis if pleural hemorrhage has occurred. Vitamin K therapy is also used as an antidote for the poison.

Hemolytic anemia manifests itself with similar signs. Dogs afflicted with this severe form of anemia, in which the immune system attacks the red blood

cells, may present with increased respiratory rate, bounding pulses, lethargy and icteric (jaundiced) membranes.

Hemolytic anemia may occur secondarily to medications, vaccines, red blood cell parasites, tick borne diseases, autoimmune diseases or ingestion toxins containing zinc such as galvanized metal objects, sun block and pennies minted in or after 1983. Therapy includes treatment of the underlying cause if found and drugs to suppress the immune system as well as blood transfusion if necessary.

Aspirin, when given in excess, can cause stomach ulcers in dogs. Clinical signs include tarry stool, vomiting and weakness. Patients may be treated with substances that coat the stomach and decrease acid production, as well as and supplements to replace protein depleted by bleeding, and blood transfusions if the anemia is severe.

There is a constellation of canine injuries and illness as treated on an emergency basis. Some, but not all, can be prevented. The Center of Veterinary Critical Care represents the joint commitment of several fields of expertise at VHUP, such as emergency medicine, intensive care and anesthesiology, to managing these emergencies. ■

J.C.

## Conference Room named in honor of Dr. Detweiler

The department of animal biology honored Dr. David K. Detweiler, professor emeritus of physiology, by naming the department's conference room on the first floor in the Rosenthal Building the David K. Detweiler Conference Room.



Dr. Joseph Spear, professor of physiology, and Dr. David Detweiler with a portrait of Dr. Detweiler that was placed in the David K. Detweiler Conference Room.