On the first day we were welcomed by Lee Arnold, Secretary of the AKC CHF and Deborah DiLalla, Executive Director of the CHF.

Matthew Breen, Ph.D. from the University Of North Carolina State University spoke about the Human/Canine Connection. In Dr Breen's specialty area, canine cancer, "we have shown quite irrefutably that dogs and humans present with the same chromosome aberrations, the same genetic lesions, in corresponding cancers."

A participant emphasized the genetic damage that results when popular sires are overused in breeding programs. "People should go back and point this out to their kennel clubs," Dr. Breen said. "The damage is unbelievable, and you won't know about it for two or three generations, until these dogs start crossing back" through pedigrees.

Dr Anita Oberbauer, Ph.D. from University of California, Davis and Jerold Bell, DVM from Tufts gave a Genetics Primer. They said some diseases are genetic but not inherited. A chemically induced leukemia or a developmental anomaly might change an animal's DNA, but "it's not in the sperm, it's not in the egg, and it will not be passed on to the next generation." If a trait is passed on, it is important to estimate the degree of its heritability and determine whether it is regulated by one, two or several genes. These factors "determine how well you can make genetic progress in engineering your animal."

Gene frequency is not altered by breeding practices, but by selection. With a finite number of quality dams, overbreeding of popular sires prevents other males from contributing to the gene pool, and genetic diversity suffers.

Dr. Heidi Parker from the National Human Genome Research Institute and National Institutes of Health explained about how they determined how different types of dogs are related to each other and to determine the origin of a gene that causes a trait or disease.

Dr Margaret V. Root-Kustritz from the University of Minnesota talked about Canine Reproduction – or not reproduction, in that she talked about gonadectemy. She said there were a wide range of benefits and detriments associated with sterilization, the decision should be based on the breed, the working purpose of the dog, and the desires of the owner.

Dr. Christine Petersen from Iowa State University talked about Infectious Disease. She talked about rabies, brucellosis, tularemia, leptospirosis, influenza, and West Nile virus. She said the best way to protect against an infections disease is to understand how it is spread and to take steps to prevent the spread among your animals.

Gail Czarnecki-Maulden, Ph.D. from Nestle Purina Research Center talked about the use of probiotics and the benefits of a balanced microbiome in the intestinal tract. Beneficial bacteria promote a healthy immune system, keep the body primed and ready to fight infections, and block attachment of potential pathogens to the intestinal wall by producing toxins to kill the pathogens.

Shifts in microflora balance and cause gut instability, resulting in diarrhea and a host of subclinical issues that may make the animal more susceptible to disease. Stress, whether good or bad, as well as travel, changes in the environment, diet or life style, poor nutrition, infection, long-term broad spectrum antibiotic therapy, and again can all upset the normal balance of intestinal microflora.

Probiotics are highly strain-dependent. Researchers at Nestle Purina Research Center in Switzerland studied 75 different strains of canine lactobacilli. Even though they were all very similar only 16 had potential probiotics activity. Each probiotics has specific antipathogenic effects, and target different diseases.

Dr. Richard Goldstein from Cornell University gave a case study on hyperparathyroidism in the Keeshond, and while interesting, is not too relevant to the Rottweiler, so if you are interested in reading the white paper, it is on the website.

Eddie Dziuk, CEO of OFA talked about CHIC. The purpose of the system is to encourage health testing and awareness, not to define normalcy; a CHIC number does not imply that a dog is free of defective genes. Breeders can do a better job of avoiding undesired traits if they know where to find them in a breed population.

The day two welcome was given by A. Duane Butherus Ph.D., Chair of the Grants Committee of the CHF and Steve Remspecher, Director of Marketing at Nestle Purina PetCare. Dr Butherus said breed health liaisons play a crucial role in helping the CHF fulfill its mission to raise money efficiently, manage it well and spend it wisely.

"We need you from the standpoint of telling us what the problems are in your breed. There's no way we can look into those problems if we don't know what they are. The better, more accurate and up-to-date your health surveys are, the better we can serve your by finding the best researchers to work on these problems."

Steve Remspecher challenged participants to "overcome the obstacles that have inhibited your club's ability to address the health issues facing your breed, whether those obstacles be financial, the lack of a plan, club politics, or that they're just not on the radar screen. We're here to help."

The keynote address was "Cytotherapeutics in Veterinary Medicine" given by **Rick Vulliet, DVM, Ph.D**. o f the School of Veterinary Medicine, University of California – Davis. He talked about the ethical debate surrounding stem cells and said "Our job is to work out what we can do, then we'll figure out whether we should do it or not." However, that is not what is going on in the real world, so researchers have quit using embryonic stem cells and are using bone marrow cells that are working in much the same way as stem cells. They don't know how these cells work, but they are working.

Mark Oyama, DVM, DAVVIM of the University of Pennsylvania talked about his research using stem cells to study cardiac conditions like mitral valve disease and dilated cardiomyopathy.

Dr. Oyama identified gene transfer as an opportunity to correct primary and secondary deficiencies, rather than trying to cure them. The emphasis isn't on replacing the damaged cell but replacing the gene in the cell that makes it damaged.

Dr. Jaime Modiano, DVM, Ph.D. from the University of Minnesota talked about Cancer Stem Cells – A New Way to Look at an Old Disease.

Dr. Modiano said being alive means an inherent risk for cancer with every cell division and life itself is the biggest risk factor for cancer. The Breen/Modiano Axiom is "Cancer is an inevitable consequence of mammalian evolution."

The lifetime risk for cancer in both dogs and people is between 30% and 50%, and cancer represents the leading cause of death for 50% of dogs aged seven and up. For some breeds, it is also the most common cause among diseases leading to death.

While most cancer is treatable, the majority of cancers are not preventable with current strategies. It is possible to reduce the risk of some cancers – for example by using sunscreen, and quitting or never smoking. Some studies show that lean, fit animals have a reduced incidence and fewer problems with cancer, suggesting that a good diet and regular exercise also help.

Dr. Butherus was the moderator of three panelists: Dr. Modiano, Dr. Oyama, and Dr. Vulliet who answered questions from participants.

A participant asked about information suggesting that rates of osteosarcoma are high in animals that have been sterilized.

Dr. Modiano said that one 2003 study based on a survey of Rottweiler owners found that dogs neutered before the age of six months seemed to have significant increase in bone cancer later in life. However, other researchers have tried without success to reproduce the data in clinical and university studies.

A participant asked about "organic" or "natural" treatments for osteosarcoma.

Dr. Modiano said most drugs are derived or modified from plant compounds. Doctors have exploited some of these poisons to kill cancer cells, but most of these compounds kill healthy cells, too. Noting "Socrates died from drinking an all-natural herbal solution," dog owners must be careful of "snake oil" and use caution when assessing products that are promoting using the terms "organic" and/or "natural."

Dr. Breen spoke about the development of the Canine Comparative Oncology and Genomics Consortium. He told us that many cancer researchers collect their own samples and that if those samples are not used, they are not used by anyone else either. The consolidation of samples will mean more rapid advances in canine research.

He told us how it began, what it will cost, how the funding was obtained, who is on the Board, and how the samples will be obtained. Money generated, once the bank is established, will be used to repopulate the bank.

CCOGC is important because it is a shared, open access facility that allows multiple researchers to work on the same population. Fewer individual researchers will need to collect their own samples, and the population of samples "will benefit many people and dogs for many years."

Rhonda Hovan, a research facilitator with the Golden Retriever Club of America spoke about understanding cancer at the breed level.

One of the things she said was that many breeders are more concerned about how cancer affects the reputation of their breeding program than the individual dog or the breed. She said age seems to be the single, greatest risk factor the cancer.

A breed's high rate of a specific type of cancer indicates an inherited disposition for that cancer. Should this be true, the potential to reduce cancer risk through breeding should be examined.

This endeavor requires identified lines within the breed that have more or less cancer risk. (Do such lines exist within the Rottweiler population?) If there are no dogs with a lower risk, there are no available genes to mediate the gene pool.

Dispelling the myths of canine cancer and its treatment, a talk given by **Douglas Thamm, VMD, DACVIM** from Colorado State University, was very insightful. He said one third of all dogs will develop cancer in their lifetimes. This does not mean cancer is more prevalent than in the past, but that dogs are living longer and receiving better care.

He said even if cancer cannot be cured, it can be treated or at least managed. Contrary to popular belief, neither biopsy using fine needle aspiration nor removal of the tumor will cause cancer to spread. When surgery is performed, a complete histopathology should be submitted for proper diagnosis. Tumors that are removed completely are less likely to recur. Recurrent tumors are often more aggressive than first-time tumors and may be associated with a worse long-term outcome.

A study of dogs with mast cell tumor illustrates this point. 70% of first-time tumors did not recur if treated immediately with surgery and chemotherapy. When allowed to recur, the risk of death within one year increased to 90%. Tumors sometimes recur because all the cancer cells were not removed during the initial treatment; the most aggressive tumor cells reside at the edges of a mass, so taking tissue from around and under the tumor, or using radiation to kill cells that may be left behind, is crucial to a successful outcome.

Next **Dr Brian Zanghi** from Nestle Purina Research Center talked about optimal nutrition for the exercising dog.

One study that focused on sled dogs compared the effects of high-fat and high-carbohydrate diets on exercising animals. Dietary fat is critical to promote fat metabolism and maintain high levels of fatty acids in the blood. Dogs that ate a high-carbohydrate diet had low levels of fatty acids in their blood both before and after exercise. Following exercise, those dogs had less ability to mobilize nutrients and promote aerobic metabolism, or higher endurance activity. When switched to a high-fat diet, subjects had higher levels of these substrates in their blood, and mobilization improved.

Nutrients can also shift the cellular makeup, as illustrated in a study of Alaskan sled dogs and Labrador Retrievers. The proportion of mitochondrial content in the muscle of Labradors on the high-carbohydrate diet was measured. The Labradors were then switched to the high-fat diet. Shifting the diet increased the Labradors' metabolic capacity to slightly greater than the metabolic capacity of the sled dogs. This data suggests that endurance is not controlled solely by genetics.

The study looked at maximum oxygen and utilization with exercise. Free radicals are a natural consequence of fat metabolism and using oxygen to generate energy. As endurance and aerobic metabolism increase, so do oxygen free radicals. Proper nutrition could mitigate negative effects of free radicals by providing antioxidant support, optimizing recovery after exercising.

Proper levels of dietary nutrients are very important to cognitive function. Blood glucose coming from glycogen stores in the liver is used primarily to support brain function, especially for staying focused and alert. With high-carbohydrate diets, the body recognizes carbohydrates as its main source of energy. It stores them as glycogen in the muscles, but at higher levels than normal. When the muscle glycogen is depleted, liver glycogen is tapped, which leaves less blood glucose for the brain to use. The result is an earlier incidence of fatigue. With high-fat diets, the body depends less on storing glycogen to support muscle function, and therefore utilizes less.

Dr. Zanghi said nutrients have been shown to support optimal weight, so even in the off season, to feed the high-performance food, just less of it.

Simon Petersen-Jones DVM, PhD from Michigan State University reported results from two projects that received partial funding from the CHF: a study of ocular melanosis in Carin Terriers and an effort to identify the genes responsible for progressive retinal atrophy.

Pedigree research to date has shown that ocular melanosis is an autosomal dominant condition, but the relevant gene has not yet been identified.
Treatments for retinal degeneration include gene or drug therapy, transplantation using progenitor stem cells and implantation of an "retinal chip" in an attempt to restore vision. All treatments are promising, and further research is ongoing.

John Lyons, CEO of AKC and Larry **Sorensen, Director of Public Education of AKC** gave us an update on AKC public education. They talked about AKC Veterinary Outreach, scholarships, veterinary college seminars, programs to support leadership development and nurture careers for young professionals with an interest in the dog community.

They described the resources available to help purebred dog owners become community ambassadors for responsible dog ownership and resources available to clubs and individuals involved in public education or public education training.

Phil Guidry, JD, Legislative Analyst for AKC talked about canine legislation. He talked about breed specific legislation, dangerous dog legislation, cropping and docking, tethering issues, consumer protection laws, saying they should cover both buyers and breeders.

"If there's anything that scares me in this whole realm, it is the issue of animal guardianship," Guidry said. These laws take animals outside property law and elevate them to quasi-personhood, and since they involve the taking of property, they raise serious Fifth Amendment issues.

AKC can monitor state jurisdictions, but not laws at the local level. That's where dog owners, breeders, and clubs must be aware of and involved in the legislative profess and get to know individual legislators.

Peter Muir, BVSc, PhD from University of Wisconsin asked the question: Is Canine Degenerative Cruciate Rupture a Consequence of Rheumatic Disease?

Dr. Muir said US pet owners spend billions each year on the health care of companion animals, but only a small fraction of that amount is spent on research.

Histology of the collagen within the stifle joint of affected dogs suggests progressive mechanical overload of the ligaments, and radiographs show differences inside the stifle, including a roughening at the edges of the bone and a greater volume of fluid within the joint due to inflammation. Dr. Muir said this suggests the actual rupture and instability occur because of a pre-existing arthritis.

Goals for the management of cruciate rupture include gaining an improved understanding of the mechanisms that lead to cruciate rupture and the identification of biomarkers for prodromal oligoarthritis, which should lead to better tools to diagnose the condition while it is still in the arthritis phase. Current surgical treatments only address dynamic instability but do not help with passive instability or inflammation: while surgery may improve a dog's condition, it will not return the dog to normal. Comprehensive treatment is important and can be developed only with a better understanding of the disease mechanism.

Ebenezer Satyaraj, Ph.D. a research scientist from Nestle Purina talked about nutrition and the immune system, advances, implications and a case study.

Dr. Satyaraj described how he evaluated, tested and formulated a diet using whey protein, and immune-enhancing ingredient.

Dr. Satyaraj conducted a pretrial test in which 48 Alaskan sled dogs, between two and six years of age were fed one of four diets, one control and three tests, named WPC1,2,and 3. The trial lasted 40 weeks. During a four week pretest period, all four groups were given the same control diet. At the end of the pretest period, the test dogs were shifted to one of the three whey protein-enhanced diets. All subjects were given a canine distemper virus vaccine, and immune measurements were taken several times throughout the trial.

The immune response in all groups was boosted immediately following the vaccine in all groups, but it did not last long. The control group dropped to starting levels. One test group showed a similar profile to the control group, but the other two test groups, WPC-1 and WPC-3 showed enhanced antibody levels that remained elevated throughout the trial.

Another test was performed to confirm whether the immune systems of these animals, having shown an enhanced response, were being over-stimulated. Levels of C-reactive protein were measured. All groups had similar readings, and all were within the normal range. The test showed the immune system of these animals were not hyperactive, but only responded when challenged.

The study also looked at fecal scores as a measure of balanced microflora. The animals were stressed by breaking their exercise routine. After two days of test, the normal exercise schedule was resumed. Fecal samples were taken before and after exercise, and tested for stress-related shifts in gut flora. The WPC-1 and WPC-3 groups showed nearly 80% similarity in their before and after stress patterns. Dr. Satyaraj said this result suggested the dogs had enhanced immune responses and were able to resist stress related changed in the gut, a clear sign of a healthy dog.

Ron Schultz, Ph.D. from the University of Wisconsin-Madison talked about canine vaccines and vaccination programs.

Guidelines were updated in 2006 and are available at www.aahanet.org. For the first time, the document lists the core vaccines – distemper, adeno, parvo, and rabies – that should be administered to every dog. The guidelines call for a last dose of core vaccine at 14-16 weeks, then at one year of age, then no more often than every three years. The minimum duration of immunity for the core vaccines is seven to ten years, revaccinating every three years adds no benefit and increases the risk of adverse reactions. Those reactions are rare, but it is not acceptable if an animal gets an inject able that is not needed and develops disease or dies.

Studies are underway to determine the duration of immunity.

For the optional vaccines, it is critical to balance the odds of infection and disease against the risk of adverse reactions, while recognizing that treatment must be repeated annually and efficacy cannot approach the core vaccines. Leptospirosis vaccines should never be combined with treatments for viruses, and should never be administered before 12 weeks of age, because of the more immediate need for viral immunity and the impact of the leptospirosis treatment on a puppy's immune system.

Dr. Schultz urged participants to report adverse reactions to veterinarians and vaccine manufacturers as a way of generating more reliable data on their occurrence.

Jerold Bell, DVM from Tufts University talked about healthy breeds and breeding recommendations.

Dr. Bell sited the popular sire syndrome as the biggest challenge to genetic diversity. When a great stud comes along "his genes get spread far and wide across the gene pool." The breed loses much of its diversity, and the stud's deleterious recessives emerge several generations later. In addition to the "bottleneck effects" that result, the breed also loses the influence of quality dogs that should not have been pushed aside.

But, the familiar breeding recommendations are often less effective than they should be. A decision not to breed two dogs that have a common recessive gene will stop that gene from being expressed in the next generation, but will not prevent it propagating to future generations. Spaying and neutering a group of animals and starting fresh will be not only impractical or objectionable for many breeders, but impracticable, if it means learning a new set of genetic variables from the ground up. "If you wanted someone else's lines you would have had them in the first place."

The end objective must always be to maintain and enhance the quality of the breed, which means looking at the entire animal and making decisions that will not limit genetic diversity.

Dr. Butherus closed, asking participants to remember the sponsor that made this possible and to communicate the information that been shared.