

“RED EYE” IN THE DOG
Dog Owners and Breeders Symposium
University of Florida
College of Veterinary Medicine
July 29, 2000

Stacy Andrew, DVM, DACVO
University of Florida, College of Veterinary Medicine

Dogs have very beautiful eyes, however they are subject to many eye diseases. Today we are going to discuss some of the more common eye diseases that affect dogs that result in an eye being described as red or irritated. “Red eye” is a descriptive term often used when an eye is painful, as the tissue lining the eye becomes inflamed or engorged.

The basic anatomy of the eye is the same in any kind of animal or human. The front clear tissue is the cornea, which is partially covered by the eyelids. Dogs have an upper and lower eyelid, as well as a third eyelid. Inside the eye is the iris (the colored portion of the eye), the lens, and the retina.

The majority of the diseases that we will discuss today are not breed specific. They can occur in any breed of dog, at any time of the year. We will divide this discussion into conjunctivitis, corneal ulcers, uveitis, and glaucoma (increased intraocular pressure), which are some of the most common causes of red eyes in dogs.

CLINICAL SIGNS or SYMPTOMS:

A red eye is often a painful eye. Pain is shown as one or a combination of the following signs in most of our canine patients: squinting, tearing, rubbing, anorexia, third eyelid protrusion, and ocular discharge of varying types. Almost any eye problem can occur as a red eye, as most eye conditions result in inflammation.

CONJUNCTIVITIS

Conjunctiva is the pink tissue that covers the eyeball and eyelids. Conjunctivitis is infection or inflammation of the conjunctiva. Conjunctivitis can be a primary disease, or a symptom or other ocular disease. The eye gets red (or has conjunctivitis) in nearly all types of eye disease. Specific causes of conjunctivitis include: allergies, infections (bacteria, viral, fungal), dry eye, and rarely parasites. Diagnostic tests that your veterinarian may perform included Schirmer tear test (to diagnose dry eye), cytology and culture (to look for cell types and infectious organisms). Treatment is to determine the underlying cause, and use initially broad-spectrum antibiotic topically. The eye should be cleaned before application of antibiotic ointment. Allergic conjunctivitis occurs fairly frequently in dogs. There may be a seasonal occurrence, associated with many allergens and more often “itchy eyes”. It is important to try and remove the allergen (if possible)!

Dry eye (keratoconjunctivitis sicca or KCS) is a very common cause of conjunctivitis in dogs. Your veterinarian should test for this by use of a tear strip. The cause is often immune-mediated, but sometimes underlying systemic disease (hypothyroidism, middle ear disease) can result in dry eye.

CORNEAL ULCERATION

Corneal ulceration refers to an eye that has been traumatized and is missing the overlying epithelium and varying amounts of the corneal stroma. Eyes that have a corneal ulcer are red and painful. Animals will squint, rub, and tear. Ulcers can result from trauma or infection. Your veterinarian will use fluorescein dye to evaluate the size and depth of the ulcer. Untreated, infected ulcers can progress rapidly and perforate. Ulcers are not to be taken lightly. Remember that all red eyes should be stained with fluorescein to look for ulcers!

UVEITIS

Uveitis is inflammation or infection of the inner tissue parts of the eye (the iris, ciliary body, and choroid). It is usually painful, and results in a red eye. There are many causes of uveitis in the dog; infectious, secondary to corneal or scleral disease, ocular manifestation of systemic disease, immune-mediated, idiopathic, toxic, and traumatic.

GLAUCOMA

Glaucoma (or increased intraocular pressure in the eye) can also cause a dog to have a red and painful eye. Pain manifested as depression, anorexia, rubbing at the eye, and/or squinting is common. If the pressure continues to elevate, blindness will occur. There are numerous medical and surgical treatments for glaucoma. The primary goal of therapy is to retain vision. Once that fails, the goal is to keep the animal comfortable and minimize pain.

Glaucoma is fairly common, and has been reported to occur in numerous breeds of dogs. Different breeds are susceptible to different types of glaucoma.

ONE MEDICINE: INTEGRATION OF EAST AND WEST

Dog Owners and Breeders Symposium

University of Florida

College of Veterinary Medicine

July 29, 2000

R.M. Clemmons, DVM, PhD

Associate Professor of Neurology & Neurosurgery

Certified in Veterinary Acupuncture

SACS, University of Florida

Some people say, “There is only one medicine: medicine which is proven; medicine which is scientific; and medicine which is good,” indicating that all other forms of medicine are bad, unscientific and unproven. I disagree. There are many forms of medicine which have been practiced (or are currently being practiced) all over the world which these people would explain away as superstition and quackery; however, some of these practices are as valid today as they were thousands of years ago.

While antibiotics, computers and other advances in equipment have revolutionized medicine, these have only been available in the last 60 years. So, what we think of as modern medicine is barely 200 years old. People lived healthy lives long before that and had existing health care systems that relied on herbal medicines, foods and body manipulations for treatment and prevention of disease. Only in the United States has modern medicine completely replaced older forms of medicine. The World Health Organization recently indicated that 80% of the world’s population relied on herbal medications as part of their primary health care.

A new movement today in medicine is to incorporate modern, Western medicine with the best of other forms of healing into a single more expansive, integrative medical system. This is based upon the concept that there is only one medicine, medicine that helps patients recover from injury and disease. Practitioners of integrative medicine combine traditional medicine with alternative forms of medicine in treating their patients based upon what problem the patient has.

Traditional medicine, that medicine taught by modern, Western medical schools, is great at diagnosing and treating acute disease. It is not always the best at preventing disease. Certainly judicious use of vaccinations has helped protect against diseases of early life; but, short of this, modern medicine has not yet embraced methods to keep most diseases from happening, particularly chronic diseases like auto-immune disorders and cancer. Only now are diet, exercise and nutritional supplements being considered as part of health and physicians are beginning to encourage patients to seek help from less “traditional” medical systems.

Veterinarians have lagged behind this movement in human medicine toward integrative care. Of course, there are a number of veterinarians who practice non-traditional forms of medicine; but most of these veterinarians do not practice conventional medicine as well as complementary medicine. Often, they wear two hats, one for conventional medical practice and another for alternative medical practice or they abandon conventional medicine altogether. This leads to a division in veterinary care rather than integration of this care. Hopefully, the movement toward integrative medicine will bridge the gap and bring both sides of traditional and complementary veterinary medicine together. Rather than to argue whom has the best way to treat a patient, the veterinarians can focus on how best to resolve any current disease then how to keep the patient healthy in the future. This is, to me, the goal of integrative medicine.

We know that the application of recent and future advances in modern medicine will not stop. We must continue to examine the inner workings of the body in terms of new developments, concepts and scientific knowledge. On the other hand, Eastern philosophers would argue that to treat the body while ignoring the spirit is not healthy practice. This is at the heart of the controversy and the movement toward incorporating alternative medicine into patient care. Many people perceive alternative medicine as a kinder and gentler approach. Science can be cold, calculating and heartless. Medicine should not be. Medicine deals with people and pets, who are not cold or heartless. The best science is no good if the patient is ignored.

The movement toward specialty practices in veterinary medicine, providing veterinarians with additional training in a specific area of medicine has furthered this division. The patients are called “a great liver case” or “a case of congestive heart failure”. That is why holistic veterinary medicine was created. It said, “No, it is a pet with a bad liver. We must take care of the whole patient, not just the liver.” However, integrative medicine goes farther.

In integrative medicine, it is understood that not every veterinarian can be an expert in all aspects of veterinary medicine, either traditional or non-traditional. On the other hand, the primary veterinarian does have the responsibility to know enough about the disease process and the various traditional and non-traditional approaches that can be taken in the diagnosis and treatment of the patient so that the best recommendation can be made for each patient. In that way, the patient can be referred to the best veterinary health care team, including traditional veterinary specialists and practitioners trained in non-traditional medicine so that the patient can receive the benefits of each. Test procedures and therapies can be coordinated and prioritized based upon the patient’s individual needs.

In this way, the body, mind and spirit can be served for both the short and the long term good of the patient. Acute care is most likely to take the form of traditional medical care, while long term health is probably best achieved with changes in the patient’s life-style, including dietary modifications, vitamin therapy, exercise, energy work (acupuncture, homeopathy and healing touch), and manual therapy (massage, physical therapy and veterinary chiropractic). Developing a comprehensive health care approach for each patient provides integrative medical care.

We still have a distance to go to see integrative medicine gain its proper place in the care of veterinary patients. The sides are still divided; however, the ground swell is beginning and many more veterinarians are embracing the concept. It is, after all, the patient that counts. Here are some areas where integrative medicine can be applied.

Exercise

The importance of regular aerobic exercise in the prevention of chronic degenerative diseases and maintenance of good health should not be overlooked. Many studies in human beings have demonstrated improved muscle performance, memory and cerebral blood flow in patients who undertake aerobic exercise. Many of the goals of treatment in chronic neurodegenerative disease are obtainable through regular exercise. Two forms of exercise seem the most useful: walking and swimming. Both have their merits and they may not be exclusive. A number of pet owners have reported that swimming assists dogs beyond the exercise of mere walking. Swimming generally increases muscle tone and allows movement without stress on joints. Walking, on the other hand, helps build strength, since gravity is involved. In older patients, particularly those with arthritis, gradually building the exercise program is important. In addition, allowing a day of rest between heavy workouts can help the patient recover faster from the exercise. A good general reference of exercise physiology and exercise programs is a book by Jeff Galloway: *Galloway's Book on Running*, Shelter Publications, Inc., Bolinas, CA 1984.

Start out with 5-10 minutes of walking or swimming every other day for two weeks. Then, increase the length of exercise time to a goal of 30 minutes twice a week and a long walk of one hour once a week. If your dog already exceeds these limits, that is fine. However, remember to provide a day of easier exercise between vigorous workouts. This is particularly important as the patient gets older. It is sustained exercise, which is important; walking in the backyard is not adequate. Many patients with chronic spinal disorders have remained functional because of the exercise alone.

Diet

The best dog food is fresh food, prepared to provide optimal nutrients while reducing risks of disease transmission. Not everyone can home prepare the diets for their pet. It does take time and extra planning.

Millions of years ago, dogs caught their own food and ate it raw. Today, however, processed raw food is not as safe as the fresh-killed food our dogs' ancestors ate. I think that all dog food should be cooked (at least on the outside) to reduce the chances for contagion and to increase the food's palatability.

Modern dogs have evolved with us and have adapted to eating what we eat. It is best to feed them diets that have been checked for their unique requirements and balanced for them. Too much variety may lead to gastrointestinal upset and diarrhea. On the other hand, adding some variety helps prevent deficiency of vital nutrients.

Commercial foods (particularly premium, natural pet foods) offer the advantage that they are convenient and they do meet the minimum daily requirements (MDR) for dogs. On the other hand, even the best commercial food does not provide extra nutrients beyond those needed to prevent specific nutritional deficiencies. In addition, the MDR for dogs were established before the increase in pollutants and stresses that our pets are exposed to today. These commercial foods can, therefore, benefit with the addition of fresh food and supplements, making them more complete and healthy.

To improve the quality of any commercial dog food, add tofu (a good source of soy lecithin, phytoestrogens and bioflavonoids), carrots (a good source of beta carotene), greens (like spinach which provides many trace minerals), and broccoli (a good source of bioflavonoids which act as anti-cancer compounds). These can be mixed by the following formula and added to make up 1/3 of the total diet (reducing the commercial food by 1/3 in amount).

- 4 oz. Tofu (soybean curd)
- 2 Whole Carrots
- 1 cup Spinach (cooked)
- 4 Tbs. Green Bell Pepper
- 4 Broccoli Spears (1/2 cup)

The tofu can be fried in olive oil and the other vegetables cooked to help in their digestibility. Most dogs will enjoy this combination and benefit from the extra nutrition provided. One way to provide this conveniently would be to get prepared stir-fry vegetables and add tofu during their preparation.

Herbal Therapy

Many of our modern day drugs originally came from plants. Even Hippocrates, the father of modern medicine, suggested that health could be maintained with regular exercise, a good night's rest, healthy diet and a few good herbs. Certainly, herbal medications help maintain the health of most of the people on the planet and most animals know instinctively about certain plants. Dogs eat grass to soothe their stomachs.

The opponents of herbal medicine point to the inconsistencies in certain preparation, variations in plant contents brought on by seasonal variations and lack of standardization from manufacturer to manufacturer. They state that herbal remedies are not FDA approved and therefore can be unsafe. All of this is potentially true. On the other hand, none of these problems is sufficient to warrant not using certain herbal remedies to help maintain health. In the cases where the herbal ingredient can be toxic, yet very beneficial, the ingredient should be isolated and reduced to the active ingredient. This is true for drugs like digitalis from the foxglove plant or vincristine from periwinkles. For many of the other herbs, reducing them to one ingredient may actually stop their action, since it is the combination of materials that make them work.

Herbal medicines can generally be separated into those which are safe for everyone, those that are safe unless there is a pre-existing medical problem, and those which are safe if used under medical supervision. The culinary herbs, if used in moderation, can be highly beneficial to health and usually cause little concern. These would include herbs like ginger and garlic. Fresh ginger is an important antiemetic drug that soothes the stomach and reduces nausea. Dry ginger can be helpful in controlling mild diarrhea. Fresh garlic is antibacterial and antifungal and can be used to help control infection. There is however, a single report of a single cat that developed a Heinz body anemia on high doses of garlic.

Herbs like *Ginkgo biloba* are probably safe unless there are medical reasons not to use it. Ginkgo improves blood flow to tissues and has anti-asthma properties. As an antioxidant, it appears to be as potent as many of our modern medications. In older people, it can improve cerebral blood flow by up to 70%, improving memory and reducing progression of Alzheimer's disease. Certainly, it has great potential in treating Canine Cognitive Disorder in older dogs. Ginkgo does have the potential, like other antioxidants, to reduce platelet function and lead to prolongation of the bleeding time. It should be used, therefore, with caution in dogs with von Willebrand's disease.

Hawthorn, *Crataegus oxyacantha*, is a heart tonic that can lower blood pressure, reduce chest pain, moderate cardiac arrhythmia and increase blood flow to the heart itself. It can improve exercise and stress tolerance. Hawthorn provides at least four benefits to the heart, all of which are the goals of modern heart patient therapy. It appears to be safe, can be used with other heart medications (although it can be synergistic with digitalis and, therefore, digitalis doses should be reduced if used with Hawthorn), and does not lose its effectiveness over time. In studies of human patients in Germany who had Type II congestive heart failure, Hawthorn was as effective as any other therapy. However, because it is used to treat (as well as prevent) heart problems, it should be used under the guidance of your veterinary health care team.

Awareness and use of herbal medications in people and animals is increasing, particularly in light of the expense of modern medications, when sometimes there are cheaper herbal alternatives. Many conditions do respond to herbal treatments and herbs can help prevent some disease processes from progressing to the point where interventions that are more aggressive are needed. Part of integrative medicine is to provide data where available, or to continue to investigate and make the data available in the future, where it is not about which herbs have effects that can help maintain health and which do not appear to have efficacy. With limits on veterinary interventions that can be undertaken, decision about what herbal remedies to use must be made wisely and frugally.

Orthomolecular

Orthomolecular medicine (OM) is an emerging tool of the 21st century. OM is the preservation of health and prevention of disease through the provision of the optimum molecular constituents of the body. Literally, it means "right molecule". Practitioners of OM believe that nutrition must come first in health, that each individual has a biochemical optimum, that drugs can be toxic and should be minimized where possible, and the pollution cannot be escaped. As such, they advocate the use of prescribed quantities of vital nutrients at levels sufficient to prevent, treat or control certain diseases. MDR of antioxidants, membrane stabilizers and cofactors (many of which are vitamins) are not enough to fulfill the body's requirements and supplementation of these levels is necessary for health.

Antioxidants include vitamin E, vitamin C, selenium, beta-carotene (vitamin A), superoxide dismutase, glutathione peroxidase, acetylcysteine, and L-methionine. Membrane stabilizers include omega-3 fatty acids, gamma-linolenic acid, coenzyme Q-10, L-carnitine, and L-aurine. Cofactors include B vitamins (niacin, folic acid thiamin, and cyanocobalamin) and trace minerals (zinc, iron, copper, and cobalt). All of these can be manipulated to provide the right individual balance for each pet.

Vitamin E is an important nutrient, which has been shown to have a number of physiologic and pharmacologic effects. It is a potent antioxidant and reduces fat oxidation and increases the production of HDL cholesterol. At higher doses, it also reduces cyclooxygenase and lipooxygenase activities, decreasing production of prostaglandins and leukotrienes. As such, it is a potent anti-inflammatory drug. It will reduce platelet function and prolong the bleeding time slightly in healthy individuals. There is no known side effects to vitamin E at levels less than 4000-6000 IU per day. A preventative level in dogs is around 10-20 IU/kg, while therapeutic levels can be between 50-100 IU/kg.

Vitamin C works with vitamin E and helps regenerate vitamin E, potentiating its antioxidant effect. Vitamin C supplementation does no harm, since the excess is excreted through the kidney. While dogs produce vitamin C in their bodies (unlike human beings and guinea pigs who must have it in their diet), under stress or disease, they may need vitamin C in excess of their manufacturing capacity. In excessive doses, vitamin C can cause flatulence and diarrhea. This intestinal tolerance level varies among dogs, but is generally around 3000 mg per day in adult German Shepherd Dogs. The dose of vitamin C to start with is around 25mg/kg twice a day.

Omega-3 fatty acids like EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) are the constituents of fish oils that act as anti-inflammatory agents and may be worth trying if your dog has an autoimmune disorder or arthritis. Many versions of these substances are on the shelves of health-food stores, from salmon oil to capsules of concentrated EPA. However, eating some cooked salmon or sardines may have benefits over capsular forms of the fish oils. Alternatively, you can give ground flaxseeds, flax oil, or hemp oil as a dietary supplement rather than fish oils. These materials will reduce platelet function for a brief period in dogs, but it seems that dogs compensate for this within about eight weeks. Omega-3 fatty acids replace the 2-series fatty acids over time. As such, cellular stimulation produces 3-series prostaglandins and thromboxanes. The later does not cause inflammation and reduce blood flow like the 2-series thromboxanes. Try 10-15 mg/kg of fish oil, 1 T. ground flaxseeds, or feed two sardines every day. Since some studies have demonstrated negative or adverse effects using fish oil capsules (due to spoilage), I prefer giving sardines or ground flaxseeds as the supplement source.

B complex is a balanced form of vitamin B supplementation, which is the only way B vitamins should be given, unless specifically instructed to give one of the B vitamins by your veterinarian. B vitamins are cofactors for a number of important biological processes. They are important in maintaining a positive environment for neural regenerative efforts. In addition, they are water-soluble so that any excess is merely eliminated in the urine. I recommend that all dogs receive B complex supplements twice a day. For small dogs, use the regular B complex. For medium size dogs, use high potency B complex (B 50s). For large dogs, use high potency stress formula B complex (B100s).

The advantage of OM therapy is that the ingredients can be optimized for each patient, supporting their optimal healing system function. The components can be used both to treat and to prevent disease, while remaining safe and cost effective. OM practitioners still need to validate efficacy of each component, demonstrate whether drug interactions exist, and provide safety information where lacking. On the other hand, OM has been practiced in one form or another for around 40 years, which seems to be the minimum time for acceptance into mainstream medicine.

Human-Animal Bond

An important aspect of your pet's development is play and attention from you, the owner. Not only do human beings benefit from contact with animals; animals benefit from the care and interaction with their owners. Companionship and care given mutually will help the owner and the pet live happier and healthier lives. No matter how busy or hectic things seem to be, be sure to spend time with your pet. It is best to set aside playtime. This can be a part of the regular exercise period, but also make time to cuddle, hold and touch your pet. It is also good to "practice" manipulations that might be needed in times of injury or illness so that they will be less stressful should they be needed. Don't worry, your pet will welcome the attention.

Vaccinations*

There are two things that have been ingrained in the teaching of veterinarians for years: 1. Dogs should eat dog food and 2. Dogs and cats should be vaccinated yearly for every disease imaginable. There is actually a lack of scientific evidence to support the current practice of annual vaccination and increasing documentation showing that over-vaccinating has been associated with harmful side effects.

While vaccination is one of the 20th century's greatest advances in medicine, saving thousands of lives by preventing childhood infectious disease, there is mounting evidence that these vaccinations may play a role in the increasing incidence of autoimmune diseases and even the cancers that we see today. Prime examples are the association of autoimmune hemolytic anemia with vaccination in dogs and vaccine-associated sarcomas in cats—both of which are often fatal. The vaccine contains adjuvants that boost the body's response to the altered vaccine materials (proteins derived from the infectious organism). This material is injected into the body, which can lead to local trauma and release of tissue antigens at the site of injection. As a result, the adjuvant can stimulate the body's immune response at these released body antigens as well as the vaccine material.

Except for rabies vaccine, the yearly revaccination recommendation on vaccine labels is only a recommendation without supporting data of long-term immune studies. It is not a legal requirement. Only rabies vaccines have required duration, immunity studies that must be carried out before they can be licensed in the United States. Even with rabies vaccines, a three-year duration of immunity product may also be labeled and sold as a one-year product. Legally, rabies vaccination is required in many areas and the accepted duration of immunity varies greatly. Working with local governments to achieve reasonable vaccination schedules for rabies is the only way to change this. On the other hand, your veterinarian can provide documentation to bypass this legal requirement, if vaccinating your pet could be medically unsafe.

Unfortunately, no one knows the real need for vaccination, but yearly boosters for all infectious diseases are overkill. Clearly, in many cases, the vaccinations are not necessary and giving them may cause problems. The risk of not giving vaccinations (once the healthy young dog has been adequately immunized) is becoming less than the risk of giving them. What appears to be the prevailing view is that dogs and cats should receive their puppy and kitten series against the

* The AKC Canine Health Foundation is currently funding research studies in antibody response and vaccine duration. For more information on these studies, refer to the website (www.akcchf.org) for sponsored research programs or request a copy of AKC/CHF currently sponsored research.

major canine and feline diseases. The vaccinations should be repeated at one year of age. After that time, only necessary vaccines should be given. That includes, of course, the legally required rabies vaccinations.

Your local veterinarian is your best resource to develop a vaccination program tailored for your pet. The health status and infectious disease risks of your pet should be considered in the selection of a vaccination program. Infectious disease risk may vary with differing localities. In addition, recent studies clearly indicate that not all vaccines perform equally.

Once puppyhood is over, further parvovirus vaccination is probably unwarranted. The disease in adults is mild and self-limiting. Intranasal vaccination for Bordetella may provide life-long immunity (although more frequent intranasal vaccinations may not carry the same risk as injected vaccines). In areas where Lyme disease or leptospirosis is not prevalent, vaccination for these agents seems unnecessary. On the other hand, vaccination for canine distemper and canine hepatitis virus is probably warranted at some time while the animal ages. There are currently three ways to do this: 1. Monitor titers and vaccinate when the IgG antibody titer drops below 1:50 (although this may not be any more valid than guessing), 2. Revaccinate when the dog gets 10-12 years old (which in many cases will be adequate), or 3. Play the odds and vaccinate every three years.

Recent studies with the major feline vaccines indicated that the worse vaccine had, at least, a three-year duration of immunity in healthy cats. The best vaccine protected cats for over eight years. The American Association of Feline Practitioners, as a result, recommends a three-year vaccination schedule for cats.

No one wants their pet to contract a preventable disease, yet most healthy animals do not need vaccination as often as is currently practiced. Immunodeficient animals may not respond adequately regardless of the vaccination schedule. Discuss these options with your veterinarian and make an informed choice about vaccination. Hopefully, your veterinarian will have thought and struggled with these issues and be able to support your decision about your pet's health.

Remember: Pets may not need yearly vaccinations, but they should still have a yearly check-up by your veterinarian.

Additional Measures

Acupuncture: Acupuncture is one form of ancient medicine which has now become mainstream and is widely accepted as a method to provide analgesia without the side-effects of drugs. Acupuncture has local effects, segmental effects at the spinal cord level and systemic effects mediated through brainstem connections with acupuncture points. Connections with the body surface and internal organs (referred to as pain pathways) allow stimulation of surface acupuncture points to influence the function of internal organs. In addition, dysfunction of the internal organs can be manifested by sensitivity of points on the body surface. Acupuncture can help treat gastrointestinal and urinary tract dysfunction. It stabilizes the adrenal gland function and may increase endogenous corticosteroid secretion without the side effects of exogenous steroid medication. Electrical acupuncture will stimulate reflex activity, improving muscle strength and allowing more rapid return of function. Generally, acupuncture is given over several treatments. If it does not provide benefits within 3-5 treatments, then further therapy may not be warranted. Acupuncture should be performed only by a veterinarian who is trained

and certified in its use; your veterinarian should be able to refer you to a qualified veterinary acupuncturist in your area.

Chiropractic Care: Veterinary Chiropractic is a rapidly emerging field in treating equine patients and is expanding in its role in treating small animals. It should be performed by a licensed Veterinary Chiropractor. In general, veterinary chiropractic involves the manual adjustments of the vertebrae to correct chiropractic, vertebral subluxations. It is felt that these subluxations result in a series of events beginning with vertebral misalignment and sequentially progressing to neuropathy, kinesiopathy (changes in normal vertebral movement), neurologic or biomechanical dysfunction, and tissue degeneration. Correcting these subluxations may reverse this process and stimulate healing.

The application of chiropractic manipulations to dogs with chondrodystrophy early in life may help prevent the development of intervertebral disc (IVD) disease by maintaining vertebral flexibility. It is likely that the dietary changes and supplements discussed above will be synergistic with this effort, also. Since chiropractic is limited to manual spinal column adjustments, you will need a veterinarian who can integrate these methods.

Once IVD disease has already occurred, chiropractic manipulations should not be performed during the acute phases, but be limited to the assistance of recovery following surgery or once the patient has sufficiently healed so that the manipulations will be less likely to cause further IVD herniation. This may be only after “strict rest” has been enforced for three weeks after the patient is normal.

Physical & Massage Therapy: Massage therapy improves muscle and joint flexibility, increases blood supply (improving nutrient delivery and waste removal), and help prevent or breakdown scar tissue formation. It also helps relax muscle spasms and aids in patient comfort levels. Massage therapy for animals should be performed by massage therapists trained in animal behavior and anatomy, under the supervision of your veterinarian. Many of the basic principles can be learned by the owner under proper instruction.

Healing Touch: Healing touch is based upon the capacity of human beings to pass “life-force” from themselves into others willing to accept this gift. Although many forms of healing touch are taught in the West, they represent teachings of the same physical process. Many studies have indicated that human contact can help lower blood pressure, reduce stress and improve the state of well being of the recipient. Human contact has also been shown to increase the immune resistance of others. These principles can be used to help animal patients heal, as well. While it is not easy to demonstrate measurable results in all cases, certainly healing touch does no harm. When done as taught by practitioners of healing touch, it does not cost the “giver” personal energy, since the “giver” acts as a conduit of “universal” life-force which is freely available from a limitless supply of life-force within the cosmos. The “recipient” is free to accept and use this life-force energy. Most Eastern philosophies of healing are based upon the concept that living beings are based upon energy which flows in the body. When the energy level is low or there is a blockage of energy flow, disease develops. Healing touch, by providing life-force energy above or below this blockage, can re-establish the natural flow of energy, allowing healing to take place.

While healing touch has a spiritual aspect, it is not a religious practice nor does it require any particular belief by the giver or recipient. What is required is recognition by the giver that this process can occur and for the giver to practice the technique to establish pathways for energy flow from them to the recipient. Distant healing touch can also be beneficial to patients. In this form of healing touch, the giver establishes a “psychic” connection with the recipient and mentally visualizes offering the life-force to the patient. Many double blind studies have shown that prayers directed at patients in human intensive care units reduce the complication rates of those patients and their ultimate length of stay in the intensive care unit. Distant healing touch and prayer seem to work through similar mechanisms, in their benefits to patients. On the other hand, belief in any specific religion is unnecessary to practice healing touch. Any person can learn and practice healing touch. In fact, most people perform healing touch without knowledge of doing so.

Healing touch may be helpful to maintain normal health in dogs. It also will assist in speeding and maximizing recovery if disease occurs. Since this can be done without risk of injury, it will do no harm; yet healing touch may increase the chances of full recovery. It also helps develop the human-animal bond. The outcome of healing touch is non-judgmental. It is a gift that is shared between the patient and healer.

Summary

Maintaining health is becoming increasingly difficult. All animals are born with a tremendous capacity to heal. In fact, most (up to 80%) patients who experience a temporary illness will overcome the illness without costly intervention. This healing system is now beginning to be understood and involves an integrated system of immune regulation by the body, offering resistance to disease and injury. Unfortunately, this healing system can be overwhelmed by many factors including poor diet, bad hygiene and chronic exposure to environmental stresses. Pollution in the environment leads to internal pollution, as the pollutants are concentrated over time. Internal pollution poisons that healing system. In the worst cases, one of two outcomes can be predicted. The immune system can be increased, leading to chronic immune diseases. Alternatively, the immune system can be shutdown, leading to cancer. It is not always possible to live in a pollution-free environment; it can come into the body through air, food or water. On the other hand, the latter sources of pollution can be minimized through healthy nutrition and safe drinking water.

Traditional Western medicine is excellent in diagnosing disease and in treating acute disease. However, the treatments of chronic immune disease and cancer have yet to achieve the same level of success. Part of this is due to the fact that these conditions respond slowly and best when the healing system is taken into account during the treatment process. Eastern medicine, which involves long-term changes in “life-style”, has many aspects which make it better in treating chronic conditions, since the goal of Eastern medicine is to support the healing system. Integrative medicine combines the best of both Western and Eastern medicine to offer the patient the best chances of returning to health. If an animal breaks its leg, it needs to be taken to an emergency facility to have it diagnosed and “set”. Once this has been performed, then the patient needs to heal, by whatever means supports that best.

Integrative medicine supports the patient, providing both the sophistication of modern care and the wisdom of age-old medicine. We must continually update and expand what upon what has gone before. Things that seemed unimaginable yesterday are the technologies of today; yet, in

medicine, the patient must always come before technology and patient care must provide the best it has to offer. It matters not whether medicine is old or new. It only matters that the patient has the chance to live a long and happy life.

HYPOTHYROIDISM IN THE DOG

Dog Owners and Breeders Symposium

University of Florida

College of Veterinary Medicine

July 29, 2000

Michael Schaer, DVM

Diplomate ACVIM, ACVECC

University of Florida, College of Veterinary Medicine

Gainesville, Florida 32610

Hypothyroidism is one of the most commonly diagnosed hormone disorders in the dog. Some cases are clinically very obvious while others are more difficult to diagnose.

Types

The causes of hypothyroidism are listed in Table 1 (pg. 4). Primary acquired hypothyroidism is the most common type of hypothyroidism in the dog. It is usually the result of lymphocytic (autoimmune) thyroiditis or thyroid atrophy. Congenital hypothyroidism is rare in occurrence. Central hypothyroidism results from damage or dysfunction to the anterior pituitary gland. The secondary form of hypothyroidism is rare.

Incidence

Estimates of the incidence of canine hypothyroidism ranges from 1:156 to 1:500. Middle-aged dogs (4 to 10 years of age) of mid-to large-sized breeds are at increased risk. Commonly affected breeds include Golden Retriever, Doberman Pinscher, Irish Setter, Miniature Schnauzer, Dachshund, Cocker Spaniel, Airedale Terrier, Great Dane and Old English Sheepdog. German Shepherd Dogs and mixed-breeds are at low risk.

Physiologic Effects of Thyroid Hormones

Most of the varied effects of thyroid hormones result from the stimulation of oxygen utilization (calorigenic action) by almost all metabolically active tissues. Tissues which do not depend on T_3 and T_4 for oxygen consumption include the adult brain, testes, uterus, lymph nodes, spleen, and anterior pituitary. As a consequence to the increased metabolic rate induced by T_3 or T_4 , nitrogen excretion is increased, internal protein and fat stores are broken down, and body weight is decreased. In young hypothyroid animals, small doses of thyroid hormones induce a positive nitrogen balance because they stimulate growth, but excessive doses will cause protein utilization.

Large doses of thyroid hormones cause excessive body heat production and a slight rise in body temperature. This, in turn, activates heat-dissipating mechanics. Excessive levels of thyroid hormone in conjunction with epinephrine secretion lead to an increased cardiac output. In

addition to these effects, thyroid hormones influence other physiologic processes as listed in Table 2 (pg. 4).

ADVERSE SYSTEMIC EFFECTS OF HYPOTHYROIDISM

Hypothyroidism is defined as a clinical condition characterized by inadequate quantities of circulating thyroid hormone. Table 3 lists the various causes of hypothyroidism in the dog. With the addition of iodized salt to commercial pet foods, hypothyroidism is usually associated with the nongoitrous (without cystic enlargement) form.

The clinical signs of hypothyroidism that are related to decreased metabolic rate and calorogenesis include lethargy, cold intolerance, decreased cerebral function, and a mild increase in body weight. Dermatologic changes are characterized by hair loss, skin thickening, and increased pigmentation.

Cardiovascular changes associated with a decreased cardiac output include a weak apex beat and a weak peripheral pulse. The electrocardiogram can show low amplitude R waves with or without a slow heart rate. Impaired peripheral circulation is suspected when the extremities seem cool to the touch.

Other clinical signs associated with hypothyroidism are decreased libido, gonad underdevelopment, anestrus, diarrhea, constipation, anemia, muscle weakness, muscle and nerve dysfunction (including cranial nerves VII, VIII and X dysfunction), and mammary milk production.

Myxedema is the extreme form of hypothyroidism. The signs in the dog are characterized by severe mental depression terminating in coma and hypothermia. Signs of hypothyroidism are usually present, but hypoventilation, hypotension, slow heart rate, and profound hypothermia are usually present as well. Often acute decompensation is triggered by an anesthetic episode. For these reasons, great care should be taken when anesthetizing a hypothyroid dog.

Endocrinologic Diagnosis

The serum T₄ determination is still the most commonly run test for initial thyroid evaluation. A normal value (1.5-4.3 μ /dl, 20-55 nmol/L) essentially rules out hypothyroidism. A very low T₄ level in conjunction with appropriate clinical signs and the absence of confounding factors is usually sufficient for making the diagnosis of hypothyroidism.

The serum T₃ determination (normal 0.7-2.3 nmol/L, 45-150 ng/dl) is commonly run but it is not as diagnostic as T₄ measurement. It is not uncommon to find normal T₃ concentrations in dogs with hypothyroidism.

The thyroid stimulating hormone (TSH) response test is used to identify hypothyroidism when the T₄ results are questionable. A reduced or no response to TSH is expected in hypothyroidism. It is important to consider that although the test will distinguish many borderline situations, the results are not always clear in dogs with nonthyroid illness or those treated with certain drugs.

However, post TSH T₄ levels greater than 45 nmol/L rule out hypothyroidism while levels less than 15 nmol/L indicate a need for replacement therapy. On the negative side, the commercial availability of TSH is unreliable and it is relatively expensive.

The free T₄ level represents the fraction of total hormone available for target cell entry. It comprises less than 1% of total T₄. The equilibrium dialysis technique is the preferred method with normal values ranging from 12-33 pmol/L (Nachreiner, MSU).

Many laboratories are now offering the TSH assay. It is essential that the appropriate standards are run with this test. Normal TSH levels range from 7-40 mU/L (Nachreiner, MSU), while the hypothyroid dog typically has elevated serum levels.

Antithyroid globulin antibody and antithyroid hormone antibody titers can be increased with lymphocytic or autoimmune thyroiditis. These dogs can be either euthyroid or hypothyroid in the presence of an elevated antibody titer. Some dogs with elevated antithyroid hormone antibody titers can also have increased measured serum thyroid hormone levels while still being clinically euthyroid. Therefore, elevated antithyroid globulin and antithyroid hormone antibodies are not reliable tests for diagnosing canine hypothyroidism.

Treatment

Primary hypothyroidism is initially treated with thyroxine (levothyroxine) at a dosage of 22 µg/kg (0.1 mg/10lb) every 12 hours. This same dose can be decreased to once daily treatment after the first month. Periodic blood level monitoring should be done 4-7 hours post-thyroxine administration, and the treatment should be adjusted accordingly.

Improved mentation and activity levels should become apparent over the first 2-7 day period. Skin and neurological improvement should occur after 1-3 months of treatment. Reproductive abnormalities might hopefully improve over a 3-10 month period.

Sodium liothyronine (synthetic T₃ Cytomel) is not the initial thyroid hormone supplement of choice. While liothyronine will raise the T₃ level, it will also lower the T₄ level through negative feedback inhibition. Synthetic T₃ therapy is indicated when levothyroxine treatment fails to achieve a desired clinical response in a confirmed hypothyroid dog. This can arise if there is impaired thyroxine absorption from the bowel.

Prognosis

The prognosis is generally good for primary hypothyroidism so long as there are no complications associated with the hyperlipidemia (coronary artery disease, acute pancreatitis) or the neuropathy.

Table 1. Causes of Hypothyroidism in the Dog

I.	<p><u>Primary hypothyroidism</u> congenital acquired – atrophy of unknown etiology autoimmune – lymphocytic thyroiditis neoplastic – bilateral thyroid carcinoma</p>
II.	<p><u>Pituitary hypothyroidism (Secondary hypothyroidism)</u> pituitary neoplasms, e.g. chromophobe adenoma congenital hypopituitarism defective TSH molecule Iatrogenic drugs (glucocorticoids) radiation hypophysectomy</p>
III.	<p><u>Tertiary hypothyroidism</u> congenital hypothalamic malformation acquired destruction of the hypothalamus</p>
IV.	<p><u>Hypothyroidism associated with goiter</u> iodine deficiency dyshormonogenesis (congenital) ingestin of various goitrogens, i.e., thiocyanates</p>

Table 2. Physiologic Effects of Thyroid Hormones

Effects of Excessive Levels of Thyroid Hormones	Effects of Inadequate Levels of Thyroid Hormones
<ul style="list-style-type: none"> ■ rapid mentation, irritability, and restlessness ■ increased CNS sensitivity to circulating catecholamines ■ shortened stretch reflex time ■ increased rate of carbohydrate absorption from the intestinal tract ■ increased lipid metabolism ■ increased requirements of water soluble vitamins and fat soluble vitamins 	<ul style="list-style-type: none"> ■ anemia resulting from decreased erythropoiesis ■ depressed lactation ■ infertility ■ decreased mentation ■ increased stretch reflex time ■ depressed cholesterol and lipid metabolism ■ impaired growth and skeletal maturation in young animals

Table 3. Common Clinicopathologic Findings in the Hypothyroid Dog

Test	Abnormalities
Hemogram	Normocytic normochromic anemia
Serum chemistries	Increased cholesterol Increased triglycerides Increased creatine kinase

GENETIC CONSIDERATIONS IN COMPANION ANIMAL NUTRITION

Dog Owners and Breeders Symposium
University of Florida
College of Veterinary Medicine
July 29, 2000

Steven S. Hannah
Ralston Purina Company
St. Louis, MO
July 29, 2000

Efforts to map and characterize the chromosomes comprising the canine genome have resulted in extraordinary progress over recent years. Today the map of the canine genome contains 341 well-spaced markers that provide an estimated coverage of over 95% (Werner 1999). The continued development of a high-resolution genetic map of the dog represents a key resource for identifying genes that control both health and disease. These efforts will result in additional diagnostic tests to identify dogs carrying these genes and allow veterinarians, breeders and owners to incorporate this knowledge into appropriate health care, nutrition and breeding practices that will minimize the occurrence of genetic disease and maximize the health and longevity of our pets.

More than 300 hereditary diseases have been described in dogs (Clark 1994, Foley 1979, Hoskins 1995, Kirk 1986, Nicholas 1987, Paterson 1980, Piddick 1987, Willis 1989). Many of these diseases have both genetic and environmental components that together influence the likelihood of an animal developing the disease. In some situations, nutritional strategies can be employed to reduce the risk of the onset of disease. The nutritional management of genetic disease is typically geared toward delivery of a nutrient profile which reduces risk of the disease in the genetically predisposed dogs or in managing the symptoms associated with the active disease process.

In the past, genetics and nutrition were considered two competing forces – nature versus nurture – in modulating the physiology of an individual. Today we know that it is the interaction of genes and nutrients along with other environmental factors that determine phenotype. The interaction of genetics and environment is the foundation for all health and disease. Nutrition represents one of the most modifiable risk factors influencing disease. As with human nutrition guidelines, companion animal nutrition guidelines assume that every animal is at equal disease risk. However, scientific evidence does not support this “one size fits all” approach. Effective strategies to reduce risk of disease will require the identification of individual animals that should be fed diets tailored to their specific dietary needs. Genetic tests are now becoming available to detect the presence of disease genes in dogs and cats.

Currently, the nutritional strategies are defined by the disease itself, i.e., the nutrient profile of a diet is developed to manage the symptoms and attempt to normalize the abnormal physiology.

As genetic knowledge progresses in the companion animal arena, we will learn more about the genes that are associated with various health and disease issues. Identification of these genes will result in advancements in assessing an individual dog or cat's predisposition to disease and other challenges it may face during its life. This knowledge will also enhance our understanding of the physiology underpinning health and disease issues, which will allow development of more effective nutritional strategy to reduce the risk of expression of genetic disease.

References

- Clark R.D. and Stainer J.R. (1994). Medical and genetic aspects of purebred dogs. Fairway, Kansas Forum Publications.
- Foley C.W., et al. (1979). Abnormalities of companion animals. Ames, Iowa: Iowa State University Press.
- Hoskins J.D. (1995). Congenital defects of the dog. Ed: Ettinger and Feldman. Textbook of veterinary internal medicine. Philadelphia, PA: W.B. Saunders Co.:2115-2129.
- Kirk R.W. (Ed). (1986). A catalogue of congenital and hereditary disorders of dogs (by breed). Current Veterinary Therapy IX. Philadelphia, PA: W.B. Saunders Co.:1281-1285.
- Nicholas F.W. (1987). Veterinary genetics. Oxford, England: Oxford University Press.
- Patterson D.F. (1980). Catalog of genetic disorders of the dog. Ed: R.W. Kirk. Current Veterinary Therapy VII. Philadelphia, PA: W.B. Saunders Co.:82-103
- Piddick H. (1987). A review of inherited disease in the dog. The Veterinary Annual 27:293-311.
- Willis M.B. (1989). Genetics of the dog. New York, N.Y.: Howell Book House.
- Werner P., Mellersh C.S., Raducha M.G., et al. (1999). Anchoring of canine linkage groups with chromosome-specific markers. Mamm. Genome 10:814-823.

RESEARCH PRIORITIES IDENTIFIED BY AKC PARENT CLUBS*

Dog Owners and Breeders Symposium

University of Florida

College of Veterinary Medicine

July 29, 2000

C. Richard Dorn, D.V.M., M.P.H.**

The American Kennel Club founded the AKC Canine Health Foundation in 1995. Since that time the Foundation has become the largest non-profit financial supporter of exclusively canine health research. The mission of the Foundation is to develop significant resources for basic and applied health programs with emphasis on canine genetics to improve the quality of life for dogs and their owners.

In order to respond to the needs of purebred dogs and their owners and breeders, the Foundation conducted an AKC Parent Club Health Survey in 1999. The objectives of the survey were to identify the highest research priority diseases, health tests being used and recommendations for testing before breeding. A questionnaire was sent to the health and genetic committees within each of 140 Breed Clubs. After one telephone call, 97 of the Clubs responded. Some of the responses were based on previous independent surveys conducted within a club. Other responses were based on the information available to members of the club's health and genetics committees.

The most frequently Breed Club identified research priority diseases were: hip dysplasia, epilepsy, cancer, allergies, hypothyroidism, bloat, progressive retinal atrophy, autoimmune disease, heart disease and cataracts. Their high frequency was given as a major reason for all of these diseases being selected as priority diseases, but frequency was not the reason given most often. For hip dysplasia, disability was the most frequent reason given. For epilepsy, allergies, thyroid, PRA and cataracts, inheritance was the most frequent reason. For cancer, bloat, autoimmune disease and heart disease, fatality was the most frequent reason. Diseases that the Breed Clubs thought were increasing in frequency included autoimmune disease, hypothyroidism, eye diseases (other than PRA, cataracts and glaucoma) and kidney disease.

Fifty percent of the Clubs encouraged health testing and 23 percent listed specific tests. The most frequently recommended tests to be performed before breeding were the Orthopedic Foundation for Animals (OFA) radiographic scoring for hip dysplasia (20 percent), PennHip examination for joint laxity (8 percent) and the Canine Eye Registration Foundation (CERF) examination (7 percent). Other recommended tests included *Brucella canis* serology, the Brainstem Auditory Evoked Response (BEAR) test, cardiac examination, PRA genetic test,

* For presentation at the Fourth Annual Dog Owners and Breeders Symposium, University of Florida, Gainesville, Florida on July 9, 2000.

** Professor Emeritus, Department of Veterinary Preventive Medicine, The Ohio State University, Columbus, Ohio 43235; and Science Officer, AKC Canine Health Foundation, Aurora, Ohio 44202

kidney examination, patellar luxation examination, elbow examination, thyroid examination, Fanconi syndrome examination, hemolytic anemia examination and fecal examination.

For the purpose of comparing the Breed club priority disease responses with the most frequent diagnoses among dog breeds receiving veterinary services, the Veterinary Medical Database maintained at Purdue University was utilized. This Database was established in 1964 and has received data from 23 veterinary college teaching hospitals in the United States and Canada. This database was examined for the 20 most frequent diagnoses for each breed. An odds ratio analysis was used to estimate the relative risk of a particular disease in a specific breed as compared to the risk of that disease in all other dog breeds combined. It is interesting that the estimated relative risk for a particular disease did not always reflect the frequency of the disease in that breed. For example, a disease such as portal-systemic shunt may be far from the most frequent disease in a breed, yet it may have an amazingly high risk relative to that of the combined group of other breeds, because of the infrequency of this diagnosis in most breeds. This relationship is well illustrated by portal-systemic shunt in Yorkshire Terriers. Other disease risk examples will be provided for dog breeds of various sizes.

The selection of researchers to receive grants from the Foundation is based on the outcome of a hierarchical review process. First, high priority diseases and high-risk breeds are listed in the Foundation's Request for Pre-proposals (RFP) distributed to scientists that may be interested in applying. Scientists may also submit pre-proposals that do not appear on this list. The Pre-proposal responses are reviewed by the Foundation's Grants Committee members who examine them for scientific promise and likelihood of controlling or preventing major disease problems. The principal investigators of the successful Pre-proposals are then contacted and invited to submit a Full Application using a standard format. The submitted Full Applications are then distributed for review by three scientific peers. The peer-reviews and recommendations are then examined by the Foundation Directors and the final distribution of grant funds is made.

Five annual grant cycles have been completed. Two hundred twenty Pre-proposals (four cycles only) have been received. One hundred sixty one Full Applications (5 cycles) were received and peer-reviewed. As of June 1, 2000, there were 56 active grants and one pending grant. Nineteen research projects have been completed. Examples of new findings and new genetic tests will be provided.

In addition to research, the Foundation provides financial support for educational programs such as the Florida Dog Owners and Breeders Symposium at the Florida State University, Veterinary School, Gainesville, Florida. Other Foundation supported educational program topics have been: Canine genetics, immunological diseases and reproductive health. The monograph entitled *Future Dog: Breeding for Genetic Soundness* by Patricia J. Wilkie, University of Minnesota, was also supported by the Foundation. The website www.akcchf.org is available for persons wishing more information about the Foundation and is sponsored research programs.

SURGERY UPDATE

WHAT'S NEW IN SMALL ANIMAL SURGERY?

Dog Owners and Breeders Symposium

University of Florida

College of Veterinary Medicine

July 29, 2000

James P. Farese, DVM, DACVS

University of Florida

The small animal surgery department at the University of Florida has been very progressive in recent years. As a service, we are dedicated to the continual process of improving our methods of diagnosing and treating surgical diseases. Some of the advancements we have utilized have completely changed our approach to many surgical problems.

NEW DIAGNOSTIC TOOLS:

To more accurately determine a diagnosis and the extent of a given problem or disease, surgeons are relying on more advanced methods of diagnostic imaging, such as magnetic resonance imaging (MRI), computed tomography (CT/"CAT" scan), and intraoperative x-rays with a C-arm fluoroscope.

Although MRI has been available (one day per week) to our hospital for some time through Shands Teaching Hospital, it wasn't until this July that our cases could have access to CT scanning. Unlike the MRI arrangement with Shands, we now have unlimited access to CT imaging. Though MRI is superior to CT scans for soft-tissue imaging (e.g. brain scans), CT scans provide better images of bone. CT images give us invaluable anatomical information that can guide us in the decision making process when considering how to manage a given surgical problem/disease. More specifically, we can better determine the extent of certain cancers (e.g. invasion into underlying bony structures) and what surgical procedure is most appropriate. Other surgical conditions CT can be useful for include: middle ear/tympanic bulla disease in dogs and cats, spinal cord disorders, joint diseases, thoracic and abdominal cavity diseases.

We have also recently purchased a new C-arm fluoroscope, which allows us to take radiographs (x-rays) during surgery and in motion/real time. The benefits of the C-arm are great, as we can perform more orthopedic surgical procedures without making a skin incision. We can also evaluate the accuracy of our orthopedic procedures (correcting bone deformities and repairing fractures) during the surgical procedure. This allows us to modify our work, if necessary, before the animal is taken out of the operating room, subjecting the animal to less anesthesia and saving the client money.

In addition to using the C-arm for orthopedic procedures, we have also started performing intraoperative angiograms (x-ray studies of blood vessels). These studies are enabling us to identify portosystemic shunts and study the vascularity of certain tumors and organs.

NEW TREATMENT MODALITIES:

On the soft tissue surgery side, we are continuing with our feline renal (kidney) transplant program. This has been a highly successful program with great public interest. Although we have only been performing transplants for three years we have several cats out in excess of two years and we believe our success will only improve with time.

We have also recently added a CO₂ laser to our Nd:YAG laser equipment and now offer full laser capabilities. We have utilized the CO₂ laser for treatment of oral papillomatosis, removal of gingival hyperplasia and plan to start using it for certain conditions seen in brachycephalic breeds, such as elongated soft palate.

Another recent development in the treatment of portosystemic shunts is the ameroid constrictor/ring. We are using this device to gradually constrict portosystemic shunts. Previously, many shunts could not be completely ligated (tied-off) during surgery without causing fatal portal hypertension.

We are frequently looking to the human surgical arena for ideas and treatment tools that we could apply to animals with similar problems. Tracheal collapse is a problem common to several small breed dogs, such as the Yorkshire Terrier. Earlier this year we used a human device called a tracheobronchial stent to treat a dog with a collapsed trachea. The procedure involved the placement of an intraluminal (inside the trachea) prostheses. This device expanded the flattened area of the trachea and will remain in place for the remainder of the dog's life.

The orthopedic section, under Drs. Lewis and Cross, continues to offer state of the art external fixation treatment for limb lengthening and angular limb deformities. Specifically, this involves the use of circular external skeletal fixators (A.K.A. ring fixators). It is a very flexible system that allows us to address very severe developmental bone problems and fractures that previously posed a great challenge to us to repair.

We have added sophisticated arthroscopy equipment to our surgical armamentarium. Although this has been utilized greatly by the large animal (equine) surgeons for some time, small animal surgeons have found more difficulty using the equipment in the smaller joints of dogs. Through the use of special instruments, including a high-resolution video camera, we can now work inside a joint to inspect and repair certain defects without opening the joint up completely with a long incision. This will allow us to diagnose and evaluate canine joint diseases such as ruptured cranial cruciate ligament, torn meniscus, fragmented coronoid process and osteochondrosis dissecans of the shoulder, elbow and stifle. The reduced invasiveness of the technique allows us to perform more bilateral procedures because it is easier for the patient to recover from the smaller incisions/approaches. Although not all joint problems can be resolved with this tool, we have performed a number of arthroscopic procedures at our hospital and are optimistic that our use of the equipment will continue to grow.

SPORTS MEDICINE SYMPOSIUM

Dog Owners and Breeders Symposium

University of Florida

College of Veterinary Medicine

July 29, 2000

Dr. Robert Gillette, DVM, MSE

Director of the Sports Medicine Program

College of Veterinary Medicine

Auburn University, AL

Optimizing Canine Performance: An Introduction¹

Canine performance is dependent upon the expectations of the owner, handler, or trainer. The dog is capable of participating in many various physical activities at many different levels. Pet dogs can serve as workout companions for their owners, they can participate in fun competitions, they can perform a working role, or they can compete at a professional level. How we judge performance is dependent upon the activity in which the dog is performing and at what level. A common mistake is to have performance expectations that are higher than the dog is capable of performing. Therefore it is important to have a good working knowledge of your dog's abilities. The handler should understand the factors that influence their dog's performance. These factors include genetics, anatomy, physiology and psychology influences. Our ultimate goal should be to optimize performance and minimize the stresses of the activity.

Optimum performance is dependent upon the dog's athletic potential, its conditioning level and its methods of training. Athletic potential is dependent upon the performance requirements of the athletic event and the amount of inherited potential with which it was born to perform that event. When the dog is conditioned properly to perform an event, its energy and thoughts are focused towards performing the tasks of the event. Dogs that are not conditioned properly must deal with the affects of fatigue. They are not mentally focused on their tasks, which limits their ability to perform. Also, as the body becomes fatigued it has an increased risk of injury. The dog's body should be properly conditioned for performance. The training program should be designed to acclimate the dog towards the rigors and demands of its performance event. As a dog becomes more accustomed to the performance routine, there is a decrease in the amount of stress placed on the dog in performing the event. Minimizing stress will allow the dog to focus on performance. Optimum performance occurs as a result of excellent breeding, peak conditioning, and the proper training.

¹ The Information provided in this manuscript is taken from: Gillette, R.L. (2000). *Athletic and Working Dogs, A guide to Maximizing Athletic Potential: Part 1 Understanding and Evaluating Performance*. A personal publication by Robert L. Gillette, © 2000.

Genetics play a very big role in the performance of every dog. Proper breeding provides our dogs with the abilities needed to perform their designated activities. If the owner has determined the activity in which they would like to participate, they can either breed for performance potential or they can purchase a dog that has been bred to perform that activity. On the other hand, if an owner already has a dog that they would like to work with, they must determine the activity that best suits athletic potential of that dog. For example, a Rat Terrier was not bred to participate competitively in oval track racing, as was the Greyhound. It would be more competitive in the sport of Earth Dog. Because of genetics, the Greyhound is not anatomically designed to participate in this sport and is better at oval track racing. Genetics also play a role at a more finite level. Certain bloodlines have more athletic potential than other bloodlines. If given the option, always select from the best potential breeding pair, it enhances your performance possibilities.

The anatomy of a dog can affect how the dog performs and its career longevity. In general, the proper conformation can allow the dog to function better and more efficiently than a dog with poor conformation. Poor conformation can predispose a dog to athletic injuries. Certain anatomical structures and body designs are more suited to certain events than other events, as seen in the Rat Terrier/Greyhound example previously mentioned. The anatomy of the functioning systems is just as important as body structure. The body of a Foxhound is better suited for endurance running than the body of a sighthound. The body of an endurance dog is designed to utilize aerobic metabolism more efficiently than the dogs built for sprint or strength activity.

The physiology influences are related to training and conditioning. We cannot change how the body was genetically assembled, but we can train the body systems to function maximally when performing an activity. A body that is trained and conditioned properly for a specific activity will allow for maximum performance and minimal stress. First, the dog should be in good general health. Second, the dog should be immunized and dewormed to prevent any subclinical illnesses from affecting the body's metabolism. Third, the body should be trained to handle the rigors of the work. Lastly, the body should be placed on a conditioning program that maximizes the body's abilities to perform the event.

A frequently forgotten influence on performance is its psychological status. A dog that is a structurally sound, in the best of conditioning, but does not have the desire to perform will continually show poor performances. Sometimes a dog is too excited and this elevated drive creates performance errors. The proper training program should include simulated working conditions or competitive events to prepare the dog for the excitement of the actual event.

Factors That Affect Performance

Every time the dog completes an event factors affect how the dog performed that event. Dogs are affected by internal factors and external factors. The internal factors include anatomical make-up, physiological function, and psychological influence. The external factors include: environmental climate and location, dog interaction, handling, functional demands and event factors. Understanding the factors involved in performance helps us to develop the knowledge we need to determine the best way to train and manage the canine athlete. These factors affect

the dog in various ways, both positively and negatively. Some dogs are able to handle certain factors better than other dogs.

External Factors

We usually do not have any control over the environmental factors. Weather factors can include heat, cold, humidity, rain or snow if the dog is working outdoors. If the dog is working indoors, we might have some control over the temperature and the humidity. The terrain can also influence a dog's performance. Rocky, mountainous, sloped terrain will be different to work on than a sandy terrain. Indoors, a hard surface may accentuate paw lameness more than a padded surface. Many different environmental factors can influence how a dog performs.

Dog interaction can influence how a dog performs. In a dog race or a coursing race, one dog can influence the dog next to it by accidentally bumping it. Dogs can also affect other dogs psychologically and emotionally. This occurs in both multiple dog workouts and single dog events. A male pointing dog's performance is usually affected when put together with a female pointer for the first time. If two dogs are kennelled together the night before a single event competition, and one is a "barker" it can keep the other dog from getting a good rest. This can affect how both dogs perform the next day. Also, health factors can be a problem when two dogs come into contact. Some dogs are affected by the presence of other dogs and in some it doesn't make a difference.

In work or competitions where the dog is worked by a handler, the handler plays a very big role in how he performs its tasks. This is both physically and psychologically. If a handler is worried or tense, the dog will feed off this. In the work where the dog performs by the handler's command, their performance can be bad because of poor handler control. This is a non-factor in the sports and work where the dogs perform alone, without the handler.

In certain sports the functional demands of the competition change. For example, in coursing and agility events the course design and setup will change between one competition and the next. The slopes of the terrain may be different or an obstacle may be added. A dog may be able to handle one setup better than another. This can then become a factor, and must be taken into consideration when evaluating its performance on the two courses.

The designs and boundaries of a course may change. In field trial dogs the time of competition can be different, for example a thirty-minute trial, a sixty-minute trial and a one hundred eighty minute trial. Certain dogs can perform better in a thirty-minute trial, and will not perform as well in a sixty-minute trial. In racing Greyhounds the length of the race can vary, for example, a 5/16-mile race versus a 3/8-mile race. If a Greyhound is changed from a shorter race to a longer race and performs better, it could be because the Greyhound prefers longer distances, or it could be the Greyhound just had a cleaner race. The design and boundaries of an event should be taken into consideration when evaluating and comparing a dog's individual performances.

Internal Factors

The internal factors that affect performance are the dog's anatomical structure, its physiological status and its psychological state. Any one of the three factors is no less important than the other ones. A dog that is a structurally sound dog, in the best of conditioning, but does not have the desire to perform will continually show poor performances. On the other hand a dog that is very driven to execute, but is not sound or is in poor health will also have poor performances. Our canine athletes must be in top physical and psychological condition to attain optimal performance.

There are three basic conditions that negatively affect performance. These conditions are pain, fatigue, and psychological alterations. The most common performance inhibitor is pain or musculoskeletal lameness. A grading system has been created by the author to help veterinarians determine the relevance of a problem to the function and performance of their patient. The five grades of musculoskeletal or physiological abnormalities in relation to performance are defined by the degree that the abnormality affects performance.

- I. Asymptomatic
- II. Symptomatic but performance unaffected
- III. Symptomatic and performance affected
- IV. Performance inhibiting
- V. Career ending

The injuries that can have the most deleterious affects on a single performance or a career are Grade I, II or III injuries. They often go unnoticed by the handler or trainer or are dismissed as not important by the veterinarian. These injuries alter the dog's movement just enough to affect performance or create secondary and tertiary problems that lead to Grade IV or V injuries.

Fatigue is a major factor in the canine athlete, especially those dogs that participate in endurance activities. The best way to prevent fatigue is to provide a proper nutrition and conditioning program that prepares the physiological systems to handle the stresses of performance. There are some medical reasons for a dog to show early signs of fatigue. These problems can usually be determined by having the veterinarian perform a hematological test, blood chemistries, thyroid blood levels, urinalysis, and a fecal on your dog. Most physiological performance problems can be detected from this data.

Psychological problems can occur as a result of lameness or a metabolic problem. For this reason, a good performance evaluation should be performed by an experienced sports medicine veterinarian before changing the training program. Too often, a trainer will assume a performance problem is a result of a training mistake or another handling problem when actually the problem is physical. Once the physical reasons are ruled out, training and behavioral problems can be addressed.

We must provide all the ingredients for our dog to perform optimally and at the same time minimize any damage that could occur as a result of that performance. Cellular or systemic injury occurs to some degree during each workout, which in turn can affect subsequent workouts.

Realizing this, it is up to the owners or trainers to address this element in their training and conditioning programs. To attain peak performance and career longevity, the training and conditioning regimen must address the extremes of competition.

Canine Conditioning Methodology²

Our canine athletes must be in top condition to attain optimal performance. Realizing this, it is up to the owners or trainers to address this element in their training and conditioning programs. To attain peak performance and career longevity the training, conditioning and nutritional regimen must address the extremes of competition and prepare the body metabolism to meet these demands.

Understanding what happens to our dogs in competition helps us to determine the care of our athletic companions. The body systems involved in performance are the muscular, skeletal, nervous, cardiovascular, respiratory, gastrointestinal, renal, hormonal and skin. Every athletic event includes some form of movement. Movement is a result of the muscles moving bones according to neuronal stimulation. The other systems work together to provide or maintain all the components needed to allow this function to occur. Muscles are used in propulsion and navigation of the body. The skeleton provides support and structure to the body. The nervous system provides stimulation, balance and direction. The cardiovascular system provides energy to the cells and removes the energy by-products. The respiratory system provides gaseous exchange and thermoregulation. The gastrointestinal tract produces energy and removes waste. The renal system provides fluid balance and waste removal. The hormones act to maintain balanced metabolism. The skin provides a protective covering from the environment, an outer membrane to the internal organs, and is responsible for optimal hair coat. Peak performance of the body as a whole is a result of the optimal, balanced output of these systems.

Since movement and body condition are factors that are common to all athletic competitions, an understanding of muscle physiology and the activity of the body during movement can help to determine how you manage your athletic or working dog. Skeletal muscles in general connect one bone to another bone. Each muscle, itself, is made up of thousands of individual muscle cells. Inside these cells are filaments composed of protein. Actin and myosin are the two types of protein chains. They interact as a result of enzyme and chemical reactions to produce muscle cell contraction. Enzymes are protein molecules that specifically interact with the actin and myosin substrates to allow the chemical reactions to occur. Calcium and phosphate, in the form of adenosine triphosphate (ATP), are the chemical components of contraction. ATP is located at the end of the myosin leverage arm. A calcium ion opens a receptor site on the actin protein chain. Energy is created when ATP releases a phosphate (P) ion producing adenosine diphosphate (ADP). The resultant energy allows the ADP to create a bond between the open actin receptor site and the myosin leverage arm. This bond changes the myosin structure providing a leverage action to produce a muscle contraction between the two fibers. The ADP is released and the lever arm is freed to reattach. Energy is then required to add a P to the ADP recreating ATP, which is then used for further contractions.

² The information for this manuscript was taken from: Gillette, R.L. (1998). Maximizing Performance of the Canine Athlete. Proceedings of the Australian Greyhound Veterinary Association Conference (pp 7-8). Sydney, Australia

The body needs energy to maintain homeostasis, and additional energy during physical activity. The body utilizes three systems to provide this energy. The type of activity defines which of the systems will be used. The immediate energy source is from the one enzyme system. It provides energy for the first five seconds up to twenty seconds. This system uses intracellular ATP, creatine phosphate (CP), and the ADP/myokinase reaction to provide energy for the increased body activity. The glycolytic pathway provides energy from five to twenty seconds up to two minutes. Energy comes from the anaerobic breakdown of glucose and is a more complicated form of energy production involving multiple steps and enzymes. The third energy source is from oxidative metabolism. It starts approximately two to four minutes after the start of the physical exercise. It is the most complicated energy system. It can use various substrates and is the most efficient system. When the body performs at a level greater than its normal daily routine, there is a greater demand for energy. The systems as a whole must work together to provide energy to the areas of need and at the same time maintain homeostasis. Therefore, the fuel resources must be at a level to meet this demand and accessible to be used as an energy source. Workout repetition compels the body to adapt itself to meet these demands. It begins by pooling energy sources at the location of greatest need, i.e. intracellular ATP, CP and glucose. Then it increases the production of the specific enzymes required for the most utilized energy systems. Workout repetition conditions the body to the stresses of competition and minimizes the chance of systemic or cellular injury.

Muscle cell types are differentiated by their energy source, contractile strength, fatigability and their energy system. Genetics play a role in cell type composition of each individual's muscle make-up. The two types of muscle fibers in the dog are the slow-twitch (type I) and the fast-twitch (type II) fibers. The slow twitch muscle fibers uses mostly aerobic energy via the oxidative energy pathway. It has a low contractile force, but is highly resistant to fatigue. Fast twitch muscle fibers utilize the glycolytic energy pathway and the one enzyme energy sources. They have a strong contractile force, but have a low resistance to fatigue. Most of the dog's type II fibers can utilize both anaerobic and aerobic energy. Nutritional, training, and conditioning programs are based on the special requirements of the different muscle types.

Once we have determined the components of competition, we can then organize our management program accordingly. Genetically we should breed for performance. Many of the essential anatomical and physiological parameters are determined genetically. The husbandry and training protocols should be defined by the factors of competition. All aspects of the body must be prepared for competition. The enzymes, proteins and chemicals must be available for proper cellular function. The transport systems must be trained and conditioned to meet the demands of competition. The everyday workout routine and feeding schedule must prepare the body for the competitive schedule that lies ahead. Once the body is trained for maximal output, we must keep the body conditioned for the rigors of competition. The ideal conditioning program maintains this level and prepares the body for optimal output when needed during competition. At the same time, this conditioning program works to minimize the damage that occurs during an athletic performance. A poorly conditioned dog is very susceptible to tissue injury and cellular damage. The goal should be for a winning career not just a winning performance.

Nutritional needs change throughout the life of an athlete. When the dog is growing the attention is towards proper, healthy structural growth. Once training begins structure is still important, but the additional ingredients should be added for the increased physical activity. As the athlete prepares for competition, feeding times become important. The basic feeding program should provide for the basic nutritional needs of the competitive season. The content of protein, carbohydrate, and fat in the feeding program is determined by the type of competition the dog will be performing. For example, dogs that perform in events that are less than two minutes will need a lower percentage of fat in their diets than those that perform in endurance events. Dogs that compete in events that are longer than two minutes require more components of the oxidative cycle. In addition, dogs that compete in events that require low energy needs should be fed a diet with a lower calorie content than those that compete in events that require higher energy levels. When defining the dietary needs of a particular athlete, first determine the physiology that is involved with the particular event.

Supplemental feeding should be timed to benefit and not hinder performance. Pre-competition snacking should be done at least two hours prior to the start of the event. This is dependent upon the ingredients of the snack, i.e. complex carbohydrates should be given at least four hours prior to competition or they can actually hinder performance. The purpose of this supplement is to round off any energy pools that may not quite be maximally filled. Simple carbohydrates would be appropriate along with vitamins E and B-complex. The most important feeding time is the post-competition snack. This is the optimum time to replenish the nutrients that have been depleted during the athletic event. Immediately after the competition and for the next one-half hour to an hour, all of the systems of the body are devoted to replenishing the deficits of the energy systems. Feeding the snack during this period promotes the uptake and optimizes replenishment of the deficient nutrients at the proper locations. This snack should be made up of simple carbohydrates, a meat protein source, calcium, phosphorus, and the hematological supplements.

Individuals that work with the canine athlete must understand the physiology of competition and work performance. The handler that has an understanding of the events that their dog performs is better able to adapt the training, conditioning and nutritional program to the schedule of their canine athlete or working dog.