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22nd Annual Symposium: Your Veterinarian and Your Dog

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22nd Annual Symposium

“Your Veterinarian and Your Dogs”

The Veterinary Hospital of the University of Pennsylvania hosted the 22nd Annual Symposium “Your Veterinarian and Your Dogs” on January 25 at VHUP. Following are summaries of the four presentations.

Diagnosis of Allergic Disease and Clinical Manifestations of Thyroidal Disease

Dr. Robert M. Schwartzman, Professor of Dermatology, discussed the manifestations and treatment of allergic diseases. He also illustrated the clinical dermatological signs of hypothyroidism.

Allergies in dogs express themselves through reactions caused by inhaled and ingested agents. Unlike people, dogs do not usually outgrow allergies. In fact, dogs often develop more allergies with age. However, measures may be taken to combat allergies, which are genetically transmitted.

Prior to instituting drug therapy, one should attempt to control the dog's allergies through environmental regulation. While cementing the dog's area is ineffective because it does not prevent pollen and other airborne agents from entering, Dr. Schwartzman recommended electrostatic filters, which absorb house dust and pollen. He also suggested central air conditioning within the home as an effective way to mitigate allergy symptoms. Also, one must be careful in selecting bedding for a dog with feather and wool allergies.

A second control measure is drug therapy. Antihistamines are, for the most part, ineffectual in controlling allergies. Cortisones, such as prednisone, are the drugs of choice because, although they do not cure the dog of allergies, they do bring comfort. Prednisone must be used judiciously, and ideally for no more than two or three months at a time. When administering steroid treatment, dosages often must be increased as the dog gets older, and one of the major drawbacks of this therapy is that it may shorten life span. However, Dr. Schwartzman advised, one must weigh quality of life versus length.

A third treatment regimen is hyposensitization (immunotherapy), whereby allergens are injected into the dog to alter the immune system. Hyposensitization has a 50%-70% success rate, and this method is safe in dogs.

Atopic allergies produce allergic responses in the skin that are often quite conspicuous. Dogs with atopic allergies tend to scratch their faces and lick their feet, which are commonly stained from the minerals in their saliva. Such dogs often exhibit staph infections as well.

A skin test, which involves injecting allergens into the skin, can be used to diagnose atopic allergies. Additionally, a blood test (ELISA) can be performed to determine if and to what the animal is allergic.

Dr. Schwartzman discussed the difficulty in diagnosing skin ailments, caused by thyroid diseases. The most common signs of hypothyroidism are skin pigmentation - usually in the neck and groin areas, scaling and crusting, hair loss, itch and bacterial infections of the skin.

Seborrhea, the major clinical manifestation of thyroid disease, is poorly understood by

veterinarians. Contrary to its name, seborrhea does not involve an abnormality in the sebaceous glands; the defect instead lies in the keratinization and desquamation, processes whereby the basal cells are transformed into fibrous keratinocytes and eventually are shed as they move upward to the surface of the skin. The normal cycle from cell birth to desquamation is twenty days. In a seborrheic case, however, the process is completed in just four days. As a result of this accelerated rate, keratinocytes are shed as large, visible pieces that exceed 200 microns in size. While thyroid disease is the primary cause of seborrhea, it is not the only one. Liver, kidney and pancreatic disease, malabsorption problems and fat-poor diet also may cause seborrhea. The breeds most commonly affected by seborrhea emanating from hypothyroidism are golden retrievers, Afghan hounds, Doberman pinschers, Chinese shar peis and cocker spaniels. In fact, 90% of Doberman pinschers being treated for seborrhea have hypothyroidism.

The main manifestation of seborrhea is scaling and crusting accompanied or unaccompanied by inflammation. Frictional points, the ears, tail, eyelids, medial aspect of the back, groin and interdigital areas are affected. The skin may become oily or waxy, and keratin often adheres to the hair shafts. The coat often has a dull and dirty appearance. The skin on the nose and pads also may become affected by abnormal keratinization. Many neutered male dogs with seborrhea have responded well to testosterone treatment.

Seborrhea is often confused with ringworm and mange, causing problems in diagnosis. As with atopic allergies and other dermatologic diseases as seborrhea, it is important to bear in mind that the skin is affected by that which is on the inside and that which is on the outside. This in-between position between two worlds often makes it difficult for dermatologists to understand the complexity of the various diseases they have to treat. J.C.

Vaccinations: The Good and the Bad

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

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

Dr. Jezyk explained that many different defense mechanisms are brought into action when an animal is exposed to a specific disease. The goal of vaccination is to activate these defenses so they can “remember” and go into action when the animal is challenged by infectious disease. Each disease organism has specific proteins (antigens). When disease invades, antibodies to these proteins are produced to destroy invading viruses or bacteria. There are different kinds of antibodies. The initial immune response produces IgM antibodies which are not as selective and often not as effective as IgG antibodies, which appear later. T-cells, another defense mechanism, can destroy cells infected by a virus. One of the first lines of defense is in the mucosa, where secretory antibodies and cell mediated immunity are most important. This system attacks and destroys invading organisms before they spread to the rest of the body.

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

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

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

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

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

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



Diagnostic Screening and the Prevention of Heartworm Infection

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

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

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

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

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

Transmission of heartworm infection is a seasonal phenomenon. A dog is more apt to become infected at a time of year when mosquitoes are in abundance, such as during July and August. Transmission has not been documented from December to April, even in southern states. In the Philadelphia area the season is probably limited to late May to the first of November most years.

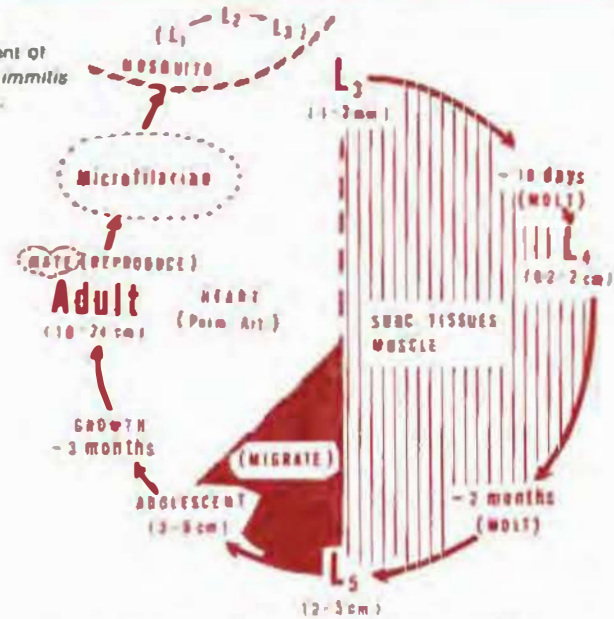
While probability of eventually contracting heartworm infection increases with the age of the dog and the frequency of contact with mosquitoes, Dr. Knight said, risk of heartworm infection can be eliminated in any dog with the use of prophylaxis. Puppies should begin monthly prophylaxis with ivermectin or milbermycin, at weaning time if risk of heartworm exposure exists at that time. Prophylaxis should be continued at prescribed dosages monthly from June 1 to November 1.

The ivermectin-like preventives, prescribed in tablet sizes which vary with the dog's weight, provide retroactive protection that spans four to six weeks. Hence, a dose administered in early June will interrupt the life cycle of a parasite that infected the dog in April. While compliance with the 28-30-day schedule should be attempted, there is at least a two week grace period, i.e. efficacy is maintained at intervals two weeks beyond the end of the recommended four week treatment cycle.

At the recommended doses, adverse reactions to the monthly preventatives are rare. There is no scientific evidence of adverse side effects when these drugs are given to pregnant bitches. At microfilaricidal dosages, dogs may occasionally experience minor anaphylactic reactions resulting from the sudden release of parasite proteins as the microfilariae are rapidly destroyed. These adverse side effects are usually limited to listlessness, nausea and low blood pressure and are usually self limiting.



Course of development of *Dirofilaria immitis* in the dog.



Proceedings of the Heartworm Symposium '74
VM Publishing, Inc. Bonner Springs, Kansas 1975

At prophylaxis dosages ivermectin has an 8 to 16-fold margin of safety for collies, which exhibit a particularly low toxic threshold.

Diethylcarbamazine is another option for chemoprophylaxis. However, it is often not the best choice, Dr. Knight said, because it must be administered on a daily basis. A treatment interruption, of even a few days, may provide an opportunity for infection. Because diethylcarbamazine is not as rapidly effective, to obtain the best results, treatment should begin one month before infection is expected, and should continue for a couple months after mosquitoes have disappeared. Dr. Knight recommended that dogs receiving DEC prophylaxis in the northeastern U.S. be treated from May 1 to December 31. Diethylcarbamazine can be toxic when given at nine to ten times the prescribed dosage.

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

Many veterinarians also perform parasitologic tests, which can detect the presence of microfilariae in the blood. This test is not always reliable because 20-25% of infected dogs do not have microfilariae in their blood. Many of these dogs do not have circulating microfilariae, even though the adult worms are present and reproducing because they become immunized to this life cycle stage. Consequently, the offspring are destroyed as they are released and never appear in the blood. Microfilariae are also absent from the blood when only one sex of adults is present in the host. Preventive treatment administered by owners unaware that their dog already harbors worms often suppresses microfilariae without affecting the adult worms.

Practitioners should also keep in mind the worms' lengthy prepatent period - six to seven months - during which time neither the antigen test nor the microfilariae test will diagnose infection.

A few dogs (less than 1%) test positive for microfilariae, but have too few worms to test positive for antigens. As a general rule, the heavier the infection, the greater the chance a dog will have a positive serology test. By combining the antigen and microfilariae tests, one may determine with greater accuracy whether infection exists.

Several guidelines should be followed when testing for heartworm. First of all, testing a puppy

under seven months of age or an adult dog exposed previously less than this length of time is futile, since heartworm cannot be detected until at least six or seven months after it is contracted. Change of seasons should also be considered. A young dog that has just gone through its first summer should not be tested until the following spring, for the same reason cited above.

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

Preventive drugs, which cost \$15-\$20 per year for a 50-lb. dog, are preferable to treatment of infection. No single drug kills both adult worms and microfilariae. IV doses of an organic arsenic compound are used to kill adult worms, while high doses of ivermectin are prescribed to eliminate microfilariae. Treatment of infection, which ranges between \$250 and \$350 depending on the diagnostic tests performed, is not 100% effective against adult worms. But when it is, the dog may temporarily suffer pulmonary embolism and thrombosis with bleeding in the lungs which must absorb and remove the dead parasites. Approximately one week after adult heartworm treatment, the dog may develop a fever and show signs of respiratory distress, so it is best to treat lightly infected dogs before the disease becomes serious.

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

Common Parasites of Canines and Their Control

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

Dr. Nolan stated that parasites were found in 25% of the 908 fecal studies done in the VHUP's parasitology laboratory last year. He differentiated between infection and disease, infection occurring when an animal harbors a parasite, and disease being manifested in damage caused by a large number of parasites in the infected animal. Infection results in disease in puppies (dogs under one year) more frequently than in adult dogs because puppies' immune systems are immature.

Continued

In Nolan's lab, 90% of cases of *Toxocara canis*, roundworm, have been found to occur in puppies less than one year old, and virtually all cases where disease has resulted have been in puppies. Adult worms are found in the small intestine. In puppies less than six weeks old, larvae penetrate the intestinal wall into a blood vessel. They travel via the blood stream to the lungs. They are coughed up and then swallowed, to return to the small intestine to mature. Here, female adult worms lay about 1/2 million eggs per day which are released into the dog's feces. Direct transmission of infection to other dogs results through contact with areas contaminated with feces.

At age three months, puppies start to develop an immunity to roundworms and the larvae usually arrest in the tissues, where they do no harm. In pregnant female dogs, however, they become reactivated by the hormonal changes. They migrate to the small intestine to mature, or penetrate the placenta and settle in the puppies' livers or migrate to the mammary glands, where they are transmitted to suckling puppies.

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

Though quite resilient, *Toxocara* eggs are subject to desiccation. Dr. Nolan recommended keeping the dog's area dry and clean. The eggs in the feces mature in approximately two weeks, so the feces should be removed immediately. Concrete runs are very effective in preventing the eggs from washing into the ground and are easy to clean.

Hookworm, *Ancylostoma caninum*, ranked second highest in frequency at VHUP last year. Normally transmitted when puppies ingest larvae with the mother's milk, it may also occur through direct contact with contaminated soil. Once ingested, larvae penetrate the intestinal walls and migrate throughout the body. In adult dogs, they either arrest in the tissues or go back to the small intestine. In females, the larvae become active late in pregnancy, and migrate to the mammary glands or, less often, the placenta.

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

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

Whipworm, *Trichuris vulpis*, is the most commonly seen gastrointestinal parasite. Dr. Nolan said that it is hard to diagnose because these worms lay fewer eggs. Present in 9% of the dogs tested at VHUP in 1991, whipworm is transmitted through ingestion of the eggs, which hatch in the small intestine. Adult worms embed their long, narrow frontal sections into the lining of the cecum and large intestine. This weakens the walls and causes damage,

which can result in bloody diarrhea and weight loss. However, symptoms only occur when many worms are present.

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

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

No disease symptoms are displayed in an infected dog. The only signs are minor intestinal distress and "scooting," whereby the dog rubs its rear along the ground to relieve irritation around the anal area caused by proglottids crawling out of the anus. Infected dogs should be treated, and fleas should be eliminated. Feces must be removed immediately, as the proglottids crawl out quickly.

The two gastrointestinal protozoans Dr. Nolan discussed are coccidia and *Giardia*. Both live in the small intestine. Coccidia are transmitted when the dog ingests cysts from feces. The cysts hatch in the small intestine, where they invade the lining of the intestine. Most veterinarians won't treat adult dogs because their immunity to coccidia is more effective than a drug.

Usually, no symptoms are evident in puppies, although minor gastrointestinal bleeding and diarrhea sometimes occur. Within two weeks after infection, the puppy's immune system is usually able to purge itself of coccidia. The cysts are very susceptible to desiccation, so it is important to keep the dog's area dry and remove the feces quickly.

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

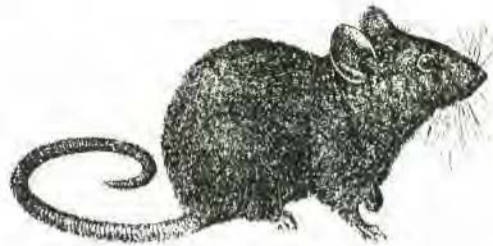
Worming should be done when puppies are about two weeks old, but Dr. Nolan cautioned against overworming, which can cause other health problems.

The ectoparasites Dr. Nolan discussed were mites and fleas. Mites are of two types - those that live in the skin and cause mange and wet lesions, and those that live in the fur and frequent the skin only to eat. Mites complete their life cycle on the dog. For prevention and treatment of mites, Dr. Nolan suggested dipping the dog, and also keeping its area clean.

Fleas lay their eggs on the dog or in the environment. The eggs are very resistant to chemicals, so it is necessary either to spray with a chemical that will outlast the incubation period, anywhere from two days to two weeks, or to spray weekly. Vacuuming is somewhat effective. Adult fleas can live for up to a year in a dormant stage if no food is available, so vacant homes that were infested should be treated if they are going to be inhabited in the same year.

Strides in Biomedical Research

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



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

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

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

Dialysis extends the lives of patients in kidney failure. Kidney transplants, first done in animals, offer 7,500 patients a second chance at life each year.

Childhood diseases, such as rubella and whooping cough, have virtually disappeared due to vaccines developed through animal research. Jonas Salk developed the polio vaccine using monkeys in 1953. Now more than 30 years later, a vaccine for chicken pox, developed using animals, is undergoing clinical trials in the United States.

Animal research has led to the discovery of penicillin and other antibiotics to treat infections. Because of these discoveries, deaths due to bacterial infection have become a rarity in the United States and many other parts of the world.

Without animal models, cancer patients would not have the options of radiation and chemotherapy. The study of treatments and cures for arthritis, cystic fibrosis, and Alzheimer's disease would be impossible. Common cataract surgery was perfected on animals, and current research to combat blindness depends on animal testing. Treatments to save burn and poison victims would not exist without the knowledge gained from animal research. In turn, this research has extended the lives of animals who are treated with vaccines, antibiotics and surgery in many of the ways that humans are aided.

Every major medical advance to cure or treat disease has been developed using research animals. These discoveries and treatments touch every human life in some way from the moment of birth.

The following is a synopsis of earlier medical breakthroughs and advances as well as ongoing biomedical research intended to improve the lives of humans and animals.

