CCAH update

Center for Companion Animal Health, UC Davis School of Veterinary Medicine
Vol. 3, No. 2, Fall 1998

Hemodialysis Provides the Bridge to Recovery in New Cases of Leptospirosis

Leptospirosis, a disease that causes kidney and liver damage in people and animals, is on the rise in Northern California dogs, and no one yet knows why.

Between 1990 and 1992, no cases of leptospirosis were seen at the UC Davis Veterinary Medical Teaching Hospital (VMTH). From 1993 until 1996, only 1–2 cases were seen per year. But during the past two years, 45 cases have been seen—about half of those have occurred since January of this year. The increase in cases has also been seen with equal frequency by local veterinarians in endemic areas, including the Bay Area and Sierra foothills, says Dr. Larry Cowgill, professor of medicine and epidemiology.

Hemodialysis Supports Dogs and Cats Suffering from Kidney Failure

The disease infects people, several wildlife species including marine mammals, and most domestic species including dogs, cows, horses, pigs and sheep. Leptospirosis is not recognized in domestic cats, although it does occur in exotic cats such as zoo lions and tigers.

Dogs with leptospirosis show obvious clinical signs of the disease, particularly vomiting and lethargy, and they have difficulty in rising due to muscle pain. They may have fevers and pain in the abdomen, and blood work will show specific kidney and/or liver disease.

How is the Disease Transmitted to Dogs?

Leptospirosis is caused by spirochete bacteria that exist as many different varieties of the species *Leptospira interrogans*. The varieties, or "serovars," are distinguished by different markers on the outer surface, or coat, of the bacterium.

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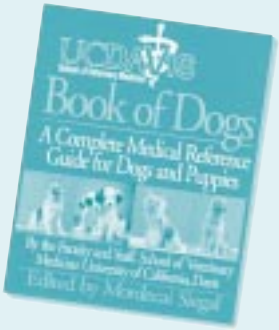

Animal health technician Joel Bea cares for Blackie, a feline patient, as she undergoes hemodialysis. The treatment improved her health, and she successfully received a kidney transplant last August.

The World's First Hemodialysis Program for Companion Animals

The world's first companion animal dialysis program was developed at UC Davis in 1990 by Dr. Larry Cowgill, after the equipment used in human dialysis became sophisticated enough to be adapted for small animals like cats and dogs. It is used primarily to treat animals suffering from antifreeze poisoning, infections of the kidney and other systemic infectious diseases that secondarily affect the kidney, such as leptospirosis.

How does it work? The patient's blood is passed over one side of a "dialyzer," the equivalent of a filter. The other side contains a solution that approximates the composition of the blood. Toxic molecules in the blood, at high concentration, diffuse across the filter and into the solution, an area of lower concentration. Excess fluids also cross the filter. After it has been cleansed, the blood returns to the patient.

The hemodialysis program includes research on new materials that can be used to remove harmful molecules from the blood, and research on the nutritional requirements of dogs with kidney failure. It has also served as a model for three other schools that developed hemodialysis programs.

Hemodialysis Treatment for Leptospirosis

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The available vaccine will not provide immunity to the serovars currently infecting dogs—it was developed against serovars that were typical for dogs in the past, but we never see those anymore, says Dr. Cowgill. The disease in dogs is now due to *Leptospira* serovars that typically affect cows and horses. It is unknown how these serovars are being transmitted. "Dogs that live in the heart of the city are being affected as well as those that live on ranches," he says.

Without dialysis, animals would be lost to accumulated toxins before antibiotic treatments could take effect.

Dogs are exposed to *Leptospira* through direct contact with the urine of infected carriers, such as wildlife or other dogs, although not all animals who are exposed become sick. If an animal's immune response clears the organism from the body, there are no signs of disease. Some animals may carry the organism without becoming sick. They shed *Leptospira* organisms (leptospires) in their urine and infect other dogs. In animals that become sick, the intensity of the disease depends on the strain of *Leptospira*.

For example, if the dog's mucous membranes (in the mouth or eyes) or abrasions on the skin come into contact with stagnant puddles of water or a pond where animals have urinated, the organism can get into the blood stream and reproduce, causing disease symptoms. Leptospires in the kidneys induce an inflammatory response, resulting in various degrees of kidney failure—accumulation of toxins in the blood and decreased urine flow.

Antibiotics are given to kill the leptospires, and with mild to moderate kidney failure, the animal can be treated with fluids. Eighty-five percent of these animals leave the hospital cured in 3–4 days, says Dr. Cowgill. But in cases of severe kidney failure, the dog may have to be treated with hemodialysis.

How Dialysis Makes a Difference

In cases with severe kidney failure, hemodialysis plays a vital role in supporting the patient. Without dialysis, animals with severe kidney failure would be lost to accumulated toxins before antibiotic treatments could take effect.

"Hemodialysis bridges the gap between the onset of kidney failure and recovery from the *Leptospira* infection," says Dr. Chris Adin, who has just completed his residency in kidney medicine and hemodialysis. "Dogs that come in with severe infections, accumulated toxins, kidney failure and poor urinary output can be supported on dialysis until they are able to recover, and 85 percent of these animals survive."

What Needs to Be Done to Protect Dogs from Leptospirosis?

In order to find out as much as possible about leptospirosis, to make the veterinary community aware of the problem and to devise new therapies and preventive measures, The Center for Companion Animal Health is committed to answering key questions:

- How widespread is the disease? Data needs to be collected on the incidence rate and any regional differences.
- What is the source of infection—how is Leptospira being transmitted to dogs? There may be a new carrier or new environmental factors leading to increased exposure of dogs to new strains of leptospirosis.
- Are the drugs currently used effective in eliminating the carrier stage of the disease? New drugs need to be tested
- Which serovars need to be included in an expanded vaccine? The available vaccine needs to include all strains of *Leptospira* that currently infect dogs.

Continued on page 3

Campaign Launched to Support CCAH Expansion and Future Advances in Veterinary Medicine

Dean Bennie Osburn has announced a $6.5 million capital campaign for private support to finance a 15,000-square-foot expansion of treatment and clinical research space for the Center for Companion Animal Health. The CCAH campaign is a key component of a broader $50 million campaign to raise funds for schoolwide priorities, announced last August during celebration of the UC Davis School of Veterinary Medicine's 50th Anniversary.

Dean Osburn says, "As we prepare to extend the school's mission of teaching, research and public service into the next century, we will be working hard to improve our physical facilities and faculty resources. We will be teaching more students and more residents to meet the growing demand for veterinarians and specialists. We will work to pursue new challenges and new discoveries and to create and disseminate knowledge for the protection of animal health."

Charter members of the 50th Anniversary Campaign Committee, alumnus John Shirley, faculty nutritionist Quinton Rogers, and committee chair Michael Floyd, are leading the fundraising effort, which will conclude in the year 2002.

Already $2.8 million has been raised for the CCAH. Dr. Floyd is making a lead gift to the campaign, a trust established with the CCAH as beneficiary. He is matching a combined $1.2 million donation from faculty members Gordon Theilen and Niels Pedersen that comprises patent royalties generated by their internationally recognized research program. Another $3.7 million is needed to begin expansion in the following areas:

- *New Canine Health Unit* to advance treatment and prevention of infectious and genetic diseases and cancer.
- *New Feline Health Unit* (to be named in memory of benefactors George and Phyllis Miller) to meet current health challenges as well as to protect cats from new and emerging diseases.
- *New Veterinary Cancer Clinic* with new clinical space for both medical and radiation oncology to treat cancers in dogs, cats and large animals.
- *Clinical Administrative Unit* with pharmacy, reception, conference, animal and teaching space.

Construction for the new clinical treatment and research programs, which will include renovation of existing space in the Vet Med II building and the addition of new space for the cancer therapy facilities, can only begin after the funds are secured—a major fundraising effort will be made during the next 12 months.

A variety of naming opportunities exists throughout the planned facilities. Benefactors like George and Phyllis Miller can be recognized for the importance of their gift by having by their name attached to new facilities such as the Canine Health Unit or Veterinary Cancer Clinic. Naming opportunities are available for CCAH contributions ranging from $10,000 to $2,000,000.

Dean Osburn says, "It will take a partnership between the school and its supporters to achieve our long-term objectives. We hope veterinary professionals, alumni and animal lovers alike, by responding to our appeal, will acknowledge that animals touch all our lives."

To learn more about the 50th Anniversary Campaign, contact the School of Veterinary Medicine Development Office at (530) 752-7024.

Successful Recovery from Leptospirosis

Continued from page 2

Liza, an outgoing 6-year-old greyhound who was adopted after her racing career ended three years ago, is visited by Dr. Larry Cowgill as she recovers from leptospirosis. After two weeks at the VMTH last August, Liza went home to San Francisco, where she lives as a companion animal.

Arie, an 11-year-old Gordon setter who made breed history after earning multiple AKC show and field titles, made a full recovery from leptospirosis after treatment at UC Davis last June. She lives on several acres in Nicasio with her owner, Carolyn Gold (right).

After they contracted the illness, each of the dogs became lethargic, began vomiting and exhibited severe kidney failure. When the dogs did not respond to traditional therapies, local veterinarians referred them to UC Davis where they could receive hemodialysis treatments. Both dogs were found to be suffering from different strains of leptospirosis than those against which they had been vaccinated.

Hemodialysis saved both Arie and Liza from being lost to kidney failure while they recovered from leptospirosis.

Director's Message to the Friends of CCAH

Sharon Anglin

Dr. Pedersen enjoys a visit from Poco, a hyacinth macaw, the bright blue companion of Dr. Lisa Tell, the school's specialist in companion avian medicine.

Dear Friends:

Our pets are not too different from us. They go through all of the same stages of life and ultimately die of the same types of diseases. Unfortunately, their lives are condensed into a period of 10-20 years or so. This means that we, as pet owners, cope more often with disease and death of our animal companions than of our human companions. In spite of the emotional traumas resulting from the death of a beloved pet, our grief is usually finite and is soon replaced by good memories. *(See letters on pages five and eight.)*

After the death of a pet, many people take a "time out." Some believe that a special animal companion cannot be replaced in a moment, while others do not want to put themselves through the trauma of losing a pet ever again. Nonetheless, almost everyone will get a new pet when the right time comes. These new animals are not replacements, because individual pets and the memories associated with them cannot be duplicated. Our new pets can soon take on their own personalities and produce their own memories, and the cycle goes on. Two months before the death of our two aged cats, Topaz and Ernie, a sick and ragged kitten found its way into our home. Yogi is now a big cat and has developed his own peculiar persona.

I am reminded over and over again about this cycle of pet life when I read the numerous letters that are sent to us, usually in response to our memorial fund. We try to share a few of these letters with you each time and regret that we cannot print them all. Without exception, these letters are upbeat and highly reflective. For some, there is a catharsis in these letters—a need to document and personalize the life of a beloved pet and to share their feelings with others. Many of our *CCAH Update* readers comment on the value of these letters in coping with their grief.

Although we cannot grant immortality to our pets, we can provide them every opportunity to live as happy and healthy a life as possible. As director of the Center for Companion Animal Health, it is my duty to help raise money for companion animal health studies and to see that it is wisely spent. By wisely, I mean that your donations are used to support studies of disease conditions that are topical, relevant, and important. It is particularly important for me to decide on areas of clinical research that are not being properly addressed. One example has been canine genetics, which is a major new initiative of the CCAH. It has been estimated that 40 percent of purebred dogs suffer from some disease problem that will affect the quality or duration of their lives. These problems range from behavioral to orthopedic, and from allergies to cancer. Most of these disorders have a genetic basis, and our goal is to discover their exact cause and to eliminate them from the breed.

Over this last spring and summer, we have seen a large number of dogs with leptospirosis. Many of them have come to our clinics with acute kidney failure and for dialysis treatment. The strains of *Leptospira* that are currently associated with the canine infection are different from those found in the common canine leptospirosis vaccine, and most vaccinated dogs are therefore not immunized. These strains of *Leptospira* seem to reside in nature, probably in wild animals. In order to try to understand and cope with this growing problem of dogs, the CCAH has initiated a study of canine leptospirosis. With the help of some key donations, we have committed support to a graduate student who is studying this infection. In three or four years' time, when he has completed his research, not only will we know a lot more about canine leptospirosis, but we also will have trained a new clinical scientist in the field.

As I have said so many times in the past, it is highly rewarding to be in a position to help make good things happen. Thank you for your assistance and your letters of encouragement.

Niels C. Pedersen, DVM, PhD
Director, CCAH

Jake San Francisco

Ginger
Citrus Heights

PJ Sacramento

Quincy Concord
(1982-1998)

Skeeter, Lucky and **K.C.** Sonora
Skeeter was found abused and abandoned at five weeks old. Lucky was found abandoned and near death.

Romeo San Francisco
(1981-1998)

Middy Shingle Springs

Blackie San Mateo

Our cat, Blackie, was treated at your teaching hospital for chronic urinary tract obstructions. He had a cystostomy tube placed in June 1997, and in September, had three large stones removed. Now he is in wonderful health and we love him more than ever. We are very thankful to Dr. Gerald Ling and all the wonderful staff, interns and students. Sincerely,

—Rose Marie and Jack Conover

Our Friends and Companions

Thanks to all the friends and supporters of the CCAH who share their love and concern for the health and well-being of our wonderful companions—and who share pictures and stories about the special animals who touch our lives.

Sasha Castro Valley

K Cee Laguna Hills

Tazzi and **Little Bear** San Francisco

Jake and **Boogie** Pleasant Hill

Chloe Orinda

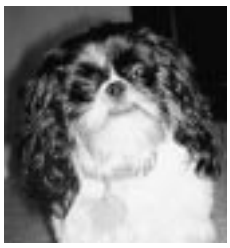
The Center for Companion Animal Health is a wonderful mission, and we are happy to be able to support your efforts.
We learned about CCAH after Mendocino Animal Hospital in Ukiah, California, made a donation in memory of our cat, Boomerang, who had just passed away. It was a great comfort to know that his doctors loved him, and that other beloved pets will benefit from their donation.
Boomerang was almost 20 years old when he died as a result of a bone tumor. He had many years of wonderful care and love from his vet Katy Sommers, DVM, and her staff at Mendocino Animal Hospital.

—Carroll and Carrie Pratt

Boomerang Philo CA
(1978-1997)

Natasha Sacramento

Pharaoh Albany



Tyler Palo Alto

Joie Gold River

Ginseng and
her kitten, **Zoe**
Antioch

Tinkerbelle Visalia
(1985-1989)

Gina and **Sunny** Petaluma

Studying the Causes of Diarrhea in Dogs and Cats

When an animal has chronic diarrhea or vomiting, a veterinarian tries to determine the underlying causes, which may be bacterial, viral or parasitic infections, dietary or other disorders.

An accurate diagnosis is very important in the management of gastrointestinal disease. Knowing how various organisms cause diarrhea can improve the therapy by making it more specific, minimizing the use of inappropriate drugs and helping to prevent adverse reactions.

Stanley Marks, assistant professor of small animal medicine, and his colleagues are working, through CCAH supported projects, on ways to more accurately diagnose infectious causes of diarrhea in cats and dogs. Dr. Marks says, "Our goal is to get a better understanding of how various organisms cause diarrhea, and to be able to tell when a particular organism is, in fact, causing the disease—just because an organism is present in the patient's stool doesn't mean it's causing the diarrhea—it could be an innocent bystander."

In the laboratory, Dr. Marks is documenting the association of various gastrointestinal pathogens with diarrhea, and is evaluating diagnostic tests for accurately determining the presence of those pathogens in cats and dogs.

The results of these collaborative studies are being shared with the scientific community in publications such as *Journal of the American Veterinary Medical Association* and *Journal of Veterinary Internal Medicine*.

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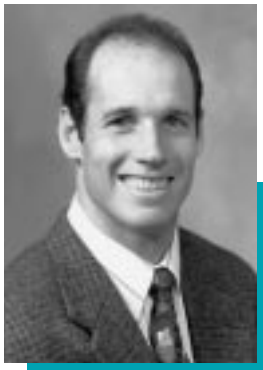

The Nutrition Support Service is staffed by resident veterinarians at the UC Davis Veterinary Medical Teaching Hospital (VMTH). They provide information—ranging from consultations to comprehensive evaluations—to VMTH clinicians and referring veterinarians, and create special diets. They answer general nutrition questions from pet owners free of charge. The Nutrition Support Service can be reached through the VMTH Small Animal Clinic, (530) 752-1393.

Health Tip:

The Role of a "Homemade" Diet in Managing Gastrointestinal Disease

—Dr. Stanley Marks, Chief, Nutrition Support Service

Diet has an important role in the management of diarrhea. A complete and balanced commercial diet is usually recommended as the first choice, but sometimes there are advantages to feeding a specifically tailored or "homemade" diet to a dog or cat with gastrointestinal disease.

For instance, many dogs with chronic diarrhea show improvement with a complete and balanced diet that is fat restricted and contains a single novel (newly introduced) protein source. Dogs with acute diarrhea are often helped with a bland, easily digested diet of cottage cheese and cooked rice, which can be fed for up to three weeks.

A homemade diet, fed under the guidance of your veterinarian, can also be advantageous in cases where restricted dietary protein and fat are indicated at levels not available in a commercial pet food.

Even though a custom diet can usually be prepared at home, it should always be formulated by a veterinary nutritionist, to make sure the diet is as complete and balanced as possible.

The UC Davis Book of Dogs *is a Complete Medical Reference for Everyone Who Needs to Understand Canine Veterinary Care—From the First-Time Dog Owner to the Professional Breeder!*

Neil Michel/Axiom

Written by dedicated experts, the *UC Davis Book of Dogs* gives owners a more complete understanding of their animal's health and allows them to act quickly and properly when a dog becomes sick or injured.

Thirty-two distinguished UC Davis veterinary teachers, clinicians, specialists and researchers, and Mordecai Siegal, a nationally recognized author of dog books, describe various systems of the dog's body, symptoms of disorders, preventive strategies and various medical treatments. Color anatomical illustrations and a glossary of terms commonly used in veterinary medicine are included. Royalties from the 538-page book, published by HarperCollins, support the canine health mission of the CCAH.

Order your copy today! The address is **VM: Public Programs/Book of Dogs**; **University of California**; **One Shields Avenue**; **Davis CA 95616-8736**. Enclose a check for **$34.59** payable to the **UCD Bookstore** for each copy. Be sure to include your shipping address!

In the Laboratory:

Searching for Causes of Diarrhea in Dogs and Cats

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Is *Helicobacter* Truly a Pathogen in Cats?

In humans, species of *Helicobacter* bacteria are associated with gastric (stomach) ulcers, gastritis and even gastric cancer—but is *Helicobacter* truly a pathogen in cats?

Small animal medicine resident Dr. Carol Norris, in collaboration with Dr. Stanley Marks, carried out a study of *Helicobacter* in completely healthy cats to see if animals with no vomiting or diarrhea harbor this particular organism. Dr. Marks says, "Almost every cat had *Helicobacter heilmannii* in their stomach, but all of the cats showed only mild or no inflammation, suggesting that gastric *Helicobacter*s alone do not cause gastritis in cats."

Dr. Janet Foley isolated *Helicobacter canis* for the first time from the colon of cats with diarrhea. She and Dr. Marks are now working to find out whether or not *Helicobacter canis* is associated with inflammation of the bowel and diarrhea.

Does *Clostridium* Cause Colitis in Dogs?

Clostridium perfringens is a spore-forming, toxin-producing bacterium commonly found in the feces of dogs with colitis. But clostridial spores (endospores) and toxin (enterotoxin) are also found in the feces of many normal dogs.

When Dr. Marks and his colleagues Dr. Dwight Hirsch and Spencer Jang examined the feces of 144 dogs, they found no difference in the number of endospores or amount of enterotoxin among healthy dogs and those with diarrhea. Their work shows that finding *C. perfringens* endospores in the feces of dogs with diarrhea doesn't necessarily mean that *C. perfringens* is the probable cause.

The investigators also found that a currently used assay is not very sensitive for detecting *C. perfringens* enterotoxins. They're now using a more advanced test, called an ELISA, that is much more sensitive and specific. They are also studying the effectiveness of a PCR (or "DNA fingerprinting") test to detect the *C. perfringens* gene that produces the toxin.

Giardia in Cats—Which Test Is Best?

Giardia is a protozoan frequently associated with diarrhea in humans, cats and dogs. It causes abdominal cramping, nausea, vomiting and diarrhea, and can be contracted by consuming water contaminated with *Giardia*, or via a fecal-oral route. Data from a study of more than 100 cats showed a tremendous daily variation in the number of cysts produced by *Giardia*—thus, a negative test on one particular day will not rule out presence of the organism.

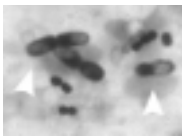
A sensitive, specific and reliable test for diagnosing giardiasis from fecal samples is very important to veterinary practitioners. For instance, an ELISA (enzyme-linked immunosorbant assay) might reveal the presence of *Giardia* cyst antigen in a fecal specimen even if no *Giardia* cysts have been detected under microscopic examination. Dr. Marks is now looking at a number of diagnostic methods, including ELISA and IFA (fluorescent antibody test), to determine which test to recommend.

Detecting *Cryptosporidium* in Cats

Cryptosporidium, a protozoan, is difficult to detect under the microscope because it's oocysts, also shed intermittently, are much smaller than those of *Giardia*. *Cryptosporidium* has been observed both in healthy cats and in association with diarrhea in cats.

"We are now looking at more than 100 cats—in a project similar to the one with *Giardia*—trying to determine which diagnostic tests are most sensitive and specific for detecting *Cryptosporidium* oocysts," says Dr. Marks. "We're looking at ELISAs, IFAs, PCR and an acid-fast stain for microscopy to be able to visualize the oocysts. We are also looking at predisposing factors that perpetuate diarrhea in cats with cryptosporidiosis."

Student intern Anne Hitchcock prepares fecal samples for diagnosis, while intern Melissa Brophy (below) searches for *Giardia* cysts and *Cryptosporidium* oocysts under the microscope. They are working on research in Dr. Marks' laboratory to determine which diagnostic methods are the most reliable.



Clostridium perfringens endospores (see arrows) are present in a canine fecal smear (right).

Helicobacter felis bacteria are present in the stomach of a cat (right). In each case, organisms are magnified several hundred times.

Postgraduate researcher Ann Melli studies bacterial culture plates inside a specially controlled environmental chamber. The rubber sleeves allow culture plates to be handled while an anaerobic atmosphere is maintained inside the chamber.

Dear Friends at CCAH, *May 20, 1998*

I loved the newsletter that came dated "Spring 1998" with the wonderful stories of pet-lovers and their best friends. I want to share with you this story of my "STAR." Star was my best friend for more than 10 1/2 years. I adopted her when she was four weeks old. She was a golden retriever-German shepherd mix, with all the finest qualities of both—a gentle, loving heart, and fiercely loyal and protective of me and our home. (I am an old lady, now 83.)

In the winter of 1994-95, when Star was a little over 10 years old, we had the worst rain I'd ever seen in my 44 years in our little old home in Pacific Palisades. Our yard drains plugged up, and our house was about to be flooded. At midnight, at 80 years old, in the drenching rain, I went outdoors and unplugged the underground drain. I saved my home, but I did myself in. My kids and my doctor got together and decided I had to sell my dear old home and move to another city to live near one of my sons.

Within that same week Star suddenly began staggering and stumbling and bumping into things. She had a head tremor that made it very difficult for her to pick up anything, even her food. So I cut it into bite-sized pieces and spaced them around a big plate for easy access. She would truly smile when bites went on the floor, and then look up with such an expression of victory when she finally retrieved them! And she still loved to play ball, even though it took several tries for her to pick it up, and brought it back to me again and again, until I was too tired to play anymore. At first it was diagnosed as, they hoped, vestibulitis. But it never got better, only worse, and finally the last little bright ray of hope for my darling Star was gone, and she for sure had cancer of the cerebellum.

She never lost her mental or emotional capacities—she was so bright and cheery, and so loving, and so brave, right to the very end. One evening, about four weeks before we were going to have to leave our home in Southern California and move to Seattle, Star suddenly started barking—something she never did unless a stranger was near. This time, it was a kind of social, conversational bark with varying tones of expression, and I realized she was talking to me. I answered her, and we went back and forth like that for almost half and hour. Fortunately, I had the thought to tape our "conversation." I think she was giving me that beautiful memory to have of her.

Then, the next day, when I had been taking some farewell photos of our home (Star and I called our living room our "very own special precious secret place"), I set the camera on the piano and sat on the couch right next to where she was sitting on the floor. Suddenly I felt her sending me a message. I looked at her. She had this sad look on her face, and in her eyes such love for me, and she was telling me, "Take my picture. Take my picture right now, just the way we are." So I went to the piano and got the camera, came back and sat down again. She hadn't moved a muscle—the same look of love and longing on her face. And I took her picture. I took it in to be developed and printed, and showed it to her the next day. We went to bed that night with old Starry Girl still stumble-bumping to her place on her big beach towel beside my bed—and the next morning she couldn't stand up—could barely even lift her head—but with that same look of love and longing in her dear old brown eyes.

"Star, when she was still young and strong, with her ball. She always liked to jump up for tennis balls best because they bounced so high for her."

I knew she would not want to live like that. I called our wonderful vet, Dr. Kathy Litochleb of the Pacific Palisades Veterinary Center, who kindly said she would come to our home to put my little best friend to sleep. A few minutes before Kathy arrived, Star, with the greatest effort, lifted her old head and laid it on my arm where we were lying beside each other on the floor. I told her I would honor her memory by trying to be as brave as she was when my time would come. And she went to sleep peacefully, in my arms—as the card says, "running ahead of me to be waiting there for me, when I would come to be with her again."

You see, she knew. *I am sure of that. She would never have wanted, in her old age, to go to a new home—even with lovely new people in my son and his wife and little girl—in a strange town, to live out her last days. But that was three years ago now, and I sure still miss that little old faithful doggie-girl heart.*

Love to you all who care so much for our best friends,

Star's best friend, "Old Betty"

—Elizabeth L. McKenzie

CCAH update

Center for Companion Animal Health Update is published by UC Davis School of Veterinary Medicine, Bennie I. Osburn *Dean*, Niels C. Pedersen *CCAH Director*, Sharon Anglin *Executive Producer*, Susan Donahue *Editor*.

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