



# INSIGHT

Summer 2000

College of Veterinary Medicine  
and Biomedical Sciences

Animal Cancer  
Center Offers New  
Hope

Drug Delivery  
Methods Expand  
Options

Hyperthermia and  
Gene Therapy

**Colorado  
State**  
University

*Knowledge to Go Places*

**INSIGHT**  
 Volume 27 Number 2  
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*On the cover: Eleanor Williams Clark and her dog Geysler share a quiet moment together in the Veterinary Teaching Hospital's memorial garden. Geysler was undergoing treatment for osteosarcoma.*

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## W elcome

Welcome to the Summer 2000 *Insight*. This special edition brings you a series of stories about the Animal Cancer Center (ACC) at Colorado State University. So many new and wonderful things are happening at the ACC, we wanted to share the excitement and just a few of the center's many inspiring stories.

In this edition of *Insight*, you'll meet Bailey and Geysler, two patients at the ACC, and follow their stories as they are diagnosed and treated for cancer. Along the way, you'll meet Dr. Steve Withrow, director of the ACC, and his crack team of veterinary researchers, technicians, and support staff, who are bringing hope to pets with cancer and their owners. Read about the Medical Oncology Laboratory, where breakthrough drug treatments are undergoing testing. Learn about new cancer treatments under investigation, including hyperthermia treatment, gene therapy, innovative drug delivery systems, and more.

You'll also learn more about the Paws for a Cause campaign and how it is raising money for the ACC to help fight cancer and educate owners about the risk of cancers to their pets. We hope you enjoy this edition of *Insight*. We welcome your questions and comments on these articles or anything else you'd like to share with us. If you'd like to get in touch with us, please send your correspondence to:

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## Message from the Dean

Dear Friends,

I imagine it would be hard to find someone whose life has not been touched by cancer. This family of diseases is endemic to our world and ranges from easily treatable to life-threatening. The good news is that a diagnosis of cancer is no longer a death sentence for many patients. The bad news is that cancer is still a leading cause of death in humans and their companion animals.

This special edition of *Insight* focuses on the College's Animal Cancer Center (ACC), where the battle against cancer is fought daily through research, treatment, and education. Explore with us the many dimensions of the ACC and meet just a few of the people who make this a world-class center of oncology care and research. You'll learn about ongoing clinical trials, nutrition studies, innovative surgical therapies, the people who comprise the heart of the ACC, and much more. You'll also share the stories of Geyser and Bailey, two of the ACC's recent cancer patients.

The ACC is growing by leaps and bounds, and I am pleased to report that fundraising for the new wing at the Veterinary Teaching Hospital to house the center is going very well. Thanks to several large private gifts, we are nearing our goal of \$10 million and should be able to begin construction next year. But the ACC is not the College's only rapidly expanding program. We have projects just completed or under construction that will accommodate several of our world-class research centers. In fact, we are the number one veterinary school in the nation in new construction, a sign that our research programs are national and international leaders in their fields.

The Department of Microbiology is expanding again to provide badly needed space for its Mycobacteria Research Group and Arthropod-Borne and Infectious Diseases Laboratory. We recently completed the new BioSafety Level 3



*Dr. James L. Voss and Dude*

Building at the Foothills Research Campus to house these expanding research programs' laboratory facilities and create additional high-quality research space.

The Diagnostic Laboratory at the Veterinary Teaching Hospital is a victim of its own success, outgrowing its old facilities, necessitating expansion with an addition on the north side of the Veterinary Teaching Hospital. The faculty and staff at the Diagnostic Laboratory, under the leadership of Dr. Barbara Powers, always

are adding new services to meet client needs. They are doing an excellent job making the most of the space they have, but will certainly appreciate a little elbow room.

Another project nearing groundbreaking is the new Equine Orthopaedic Research Laboratory north of the Veterinary Teaching Hospital. Thanks to private fundraising efforts, the \$1.5 million to construct the building is nearly in hand, and construction should begin early next year.

These exciting projects would be impossible without the world-class faculty and support staff found within the College. We also wouldn't get very far without the financial support of the many individuals and organizations who have provided private funding to make such excellence possible. We celebrate our accomplishments together and look forward to new opportunities and challenges. ■

Best regards,

James Voss, D.V.M.  
Dean, College of Veterinary Medicine and Biomedical Sciences

## Related Thanks to the Swards

We strive for accuracy at *Insight*, but every so often we have an "oversight." In the 2000 Report on Private Giving, we inadvertently left out R. Lee and Rebecca Seward. The Swards, great supporters and friends of the College, established a pending endowment with a \$5,000 donation. The endowment is an unrestricted

fund for the support of the Office of the Dean, structured to allow the Dean to determine where the funds will be put to the best use.

We apologize for our mistake and would like to take this opportunity to thank the Swards for their generosity and continued support of the College. ■

## Animal Cancer Center Offers New Hope to Companion Animals

When Eleanor Williams Clark and her husband, Dennis, returned home from an early spring vacation in Colorado, they immediately saw that there was a problem with their beloved family dog, Yellowstone's Geyser.

"He was limping badly, and at first, we thought that maybe he had gotten into a scuffle with an elk," said Clark, who is the chief landscape architect at Yellowstone National Park. "We soon found out that it was something much worse."

At the same time, Chris Shaw, who works for Ski Utah, and her father, Roger Lewis, a Salt Lake City music teacher, were keeping a close eye on their 8-year-old yellow Labrador retriever mix. Bailey had developed an on-again, off-again limp that was getting increasingly worse. Lewis, after consulting a veterinary medical book, told his daughter that Bailey was showing the classic symptoms of osteosarcoma, or cancer of the bone.

After a visit to their veterinarian, Lewis and Shaw's worst fears were confirmed. Bailey had a tumor in his left front leg just above the wrist. For the Clarks, a

visit to their veterinarian revealed that Geyser, a 6-year-old golden retriever, also was suffering from osteosarcoma. Geyser's large tumor was located in his left scapula, dangerously close to his chest wall.

The odds for both dogs didn't look good. Clark consulted with more than a dozen veterinarians, while Shaw's Internet research led her down a short path of treatment options. Late in May, both Bailey and Geyser found themselves at Colorado State University's Animal Cancer Center (ACC), where their owners had come looking for a miracle.

"Concerned owners from almost every state in the nation have come to the Animal Cancer Center to seek treatment for their pets," said Dr. Stephen Withrow, director of the ACC and the treating clinician for Bailey and Geyser. "Each week, we consult on oncology cases with more than 300 veterinarians and owners from across the country and around the world. Each year, we see more than 1,500 new patients and set more than 7,000 appointments. The optimism we feel for treating cancer successfully is permeating the public and helping to generate demand for companion animal cancer care."

For companion animals, such optimism was not always the case. When Dr. Withrow graduated from veterinary school, there was no such thing as veterinary oncology. A diagnosis of cancer usually meant treatment with cortisone (steroids) – largely ineffective – or a quick euthanasia. The ensuing years, however, have brought vastly improved treatment options and outcomes.

"Advances in veterinary medicine overall have set the stage for improved cancer treatment," Dr. Withrow said. "Anesthesia and critical care have enabled the survival rates from cancer treatment to rise dramatically. New treatment options

**"Concerned owners from almost every state in the nation have come to the Animal Cancer Center to seek treatment for their pets."**

in human oncology have transferred to veterinary oncology, enhancing care and prognosis, and we have developed new veterinary cancer treatments that mean hope and life for our patients."

The Animal Cancer Center, often referred to as the "Mayo Clinic" of animal cancer, has been a national and international leader in developing new cancer treatments and diagnostic tools for animal cancers, as well as in caring for the needs of the patients' owners. With more than 40 people on staff, the ACC is the world's largest animal oncology research, teaching, and treatment center.

Among its many accomplishments since its inception, the ACC has:

- Perfected revolutionary limb-sparing surgical procedures used to treat osteosarcomas in animals and humans.
- Trained more veterinary surgical, medical, and radiation oncologists than any other veterinary institution.
- Pioneered surgical, chemotherapy, and radiation protocols that are shared daily with veterinarians around the world.
- Received more than 25 years of funding from the National Cancer Institute, the only veterinary group to do so.
- Developed unique drug delivery systems to improve post-operative chemotherapy and radiation.
- Conducted extensive nutritional studies to improve diets for animals undergoing cancer treatment.
- Instituted the first services in the country offering counseling to pet owners.



Chris Shaw, Dr. Stephen Withrow, and Bailey

- Maintained the most innovative and longest running radiation therapy program for animals in the world.

For Geysler and Bailey, the Animal Cancer Center has provided a new lease on life. Dr. Withrow was able to remove Geysler's tumor, though it was frighteningly close to invading the chest wall.

"I know that Dr. Withrow saved Geysler's life," Clark said. "While Geysler was in surgery, complete results of his CAT scan came back, and Dr. Withrow was advised that the tumor had gone too far – it was just huge. But Dr. Withrow went with his gut and felt he could remove the tumor safely, which he did. Without his experience, I know we wouldn't have Geysler today."

Dr. Withrow removed most of Geysler's scapula during the difficult surgery. He was able to save part of the bone and leave Geysler's biceps attached, but the triceps had to be cut and reattached to the remaining bone. Now, nearly two months post-surgery, Geysler is romping again at his family's Yellowstone cabin.

"His margins came back clean, and the rest of his bone seems normal," Clark said. "He is handling his chemotherapy well, having to go every three weeks for a total of six treatments. But so far, he's looking good, and we're positive about the future. We came from having no hope at all to having our beautiful dog alive and well beside us."

Bailey also was treated with limb-sparing surgery, using donor bone to replace the diseased bone that was removed from his leg. Shaw said that today he is walking well on the leg, his old rambunctious personality is back, and she and her father are hoping that Bailey is one of the dogs that will beat the odds.

"Fifty percent of the osteosarcoma



*Geysler undergoes surgery to remove a tumor, but leave as much of the scapula intact as possible.*

dogs survive one year post-surgery, 30 percent survive two years, and the remaining often can live a normal life, where the treatment has actually cured their cancer," Shaw said. "We hope Bailey falls into the latter group, but however much more time we have with him is a gift."

For Dr. Withrow, the stories of Bailey and Geysler are just two of the many happy tales he experiences regularly through his work.

"As a veterinary oncologist, I often have people ask me how I can do what I do," Dr. Withrow said. "So many people equate cancer with suffering and death, they can't imagine how I face it on a daily basis. Like any other oncology specialist, whether animal or human, my response is to first do away with their perception of cancer as a death sentence. My work is filled with recovery, hope, and many happy endings."

Both Bailey and Yellowstone's Geysler are living proof of that. ■

## Protect Your Pet

### Watch for These Warning Signs of Cancer

Despite all the advances in diagnosis and treatment, cancer remains a leading cause of disease-related death in small animals. In a recent Mark Morris Foundation Animal Health Survey, cancer was the cause of death in 47 percent of dogs and 32 percent of cats.

The prevalence of cancer among companion animals is increasing due to a number of factors, the main one being age. Pets are living longer because of improved nutrition, vaccinations, better preventive and therapeutic medical practices, leash laws, and owner devotion. Cancer often is the price pets pay for their longer lives. But owners can help protect their pets by keeping an eye out for early warning signs of cancer.

The 10 common warning signs of cancer, developed in cooperation with the American Veterinary Medical Association, are:

1. Abnormal swellings that persist or continue to grow
2. Sores that do not heal
3. Weight loss
4. Loss of appetite
5. Bleeding or discharge from any body opening
6. Offensive odor
7. Difficulty eating or swallowing
8. Hesitation to exercise or loss of stamina
9. Persistent lameness or stiffness
10. Difficulty breathing, urinating, or defecating

The four most dangerous words in veterinary medicine are, "Let's just watch it." Early diagnosis is key to successful treatment. Contact your veterinarian if your pet is showing any of the early warning signs of cancer. ■

## Studies of Drug Delivery Methods Expand Options for Cancer Patients

Geyser, the dog from Yellowstone, may not be able to appreciate the fact that he is walking around with a state-of-the-art drug delivery device implanted in his shoulder. But his owner, Eleanor Williams Clark, certainly can. The chemotherapy



*Dr. Bill Dernell and his dog Shadow*

polymer surgeons placed in Geysler following his limb-sparing surgery will decrease the chance that his cancer will metastasize and increase the odds that he will live a longer, healthier life.

"Historically, our work comes from the limb-sparing program that Dr. Stephen Withrow started many years ago," said Dr. Bill Dernell, who conducts research on polymer systems for intracavitary drug delivery. "With limb-sparing, there is a high chance of leaving tumor cells in the patient. Intensive chemotherapy pre-surgically to kill these orphan tumor cells is expensive and very involved. Steve was after one-stop shopping, where the chemotherapy could be done at the same time as the surgery."

Researchers developed

drug delivery systems that use polymers to slowly release cancer-fighting drugs into the patient. The biodegradable polymers last for about 60 days, releasing the majority of their drug load in the first three weeks. Veterinary researchers also can

fine-tune release amounts and time by using different polymers and drug concentrations. Localized use was the first priority with osteosarcomas, but researchers are looking at ways to expand the usefulness of these innovative treatment delivery systems. Intracavitary (within the wound) therapy is now being studied for its efficacy in treating soft tissue tumors.

"In our studies, we removed the tumor and put in the polymer, and the results looked pretty comparable to treatment with radiation," Dr. Dernell said. "However, we did see some complications because wounds had more difficulty healing."

Dr. Dernell is studying liquid polymers as a possible solution to wound complications that occur as a result of us-

ing hard polymers. The liquid polymers mold to the wound and then harden, enabling smaller and more accurate sizing.

In an innovative new project underway, Dr. Dernell and his research team are examining the efficacy of polymer delivery systems in treating breast cancer. Using a mouse model that has similar characteristics to human breast cancer, researchers are showing that polymers can control local disease as effectively as intravenous chemotherapy.

"An exciting part of this is that in many Third World countries, treatment for breast cancer is substandard because of the difficulty in follow-up treatment with chemotherapy and radiation," Dr. Dernell said. "With polymer delivery, patients could receive their long-term chemotherapy at the same time as their surgery, and outcomes should improve."

In addition to the research team at Colorado State University, Dr. Dernell works closely with pharmacology professor Mark Manning from the University of Colorado's Health Sciences Center in Denver. The two also are studying the delivery of antibiotics using biodegradable polymers, hoping to reduce infection rates in limb-spare patients. Dr. Dernell also works with Atrix Labs, a Fort Collins-based company interested in using its products for drug delivery systems, particularly for the cancer drugs taxol and cisplatin.

"I feel very comfortable with the polymer release systems. There are a lot of applications," said Dr. Dernell. "The problem is drug companies are not too interested in delivery systems, so we must

be able to demonstrate their cost effectiveness and treatment value. If we can show it works in animal systems, that gives a leg up for human use, and ultimately that's the market drug companies want. Meanwhile, we are seeing great benefits in our animal patients, many of whom wouldn't have the quality or quantity of life they enjoy without these technologies." ■

**Using a mouse model that has similar characteristics to human breast cancer, researchers are showing that polymers can control local disease as effectively as intravenous chemotherapy.**

## Researcher Examines Underlying Causes of Cancer

At its most basic level, cancer is easy to understand – cells growing out of control. But what is it that triggers cells to undergo this Jekyll-and-Hyde metamorphosis? This question obviously has not one but many answers.

Some answers are well known: excess lifetime exposure to the sun causing skin cancer, cigarette smoking causing lung cancer, or a genetic predisposition to breast cancer; but other possible answers to this question are more subtle and remain under examination. Dr. John Reif, an epidemiologist and head of the College's Department of Environmental Health, has devoted his professional career to studying the environmental causes and contributors to cancers in animals and humans.

"I am interested in the causation and prevention of disease by understanding the risk factors in our environment," said Dr. Reif. "If we can identify the risk factors for human and animal cancers, we may be able to mitigate and reduce exposure, aiding in the prevention of cancer."

Over the years, Dr. Reif has studied a number of different environmental risk factors. These include urban air pollution, second-hand smoke, electromagnetic fields, low-level radiation from uranium tailings, and pesticides. While many of these projects are still ongoing, his current area of intense focus is on water disinfection by-products from chlorination of drinking water.

In this study, Dr. Reif, Dr. Steve Withrow, and colleagues from the National Centers for Disease Control are conducting an epidemiological survey of 200 cases of dogs with bladder cancer and comparing those dogs to 200 dogs with normal bladders. All were patients at the Colorado State University Veterinary Teaching Hospital.

"What we are doing is reconstructing a lifetime history of exposure to chlorination by-products," Dr. Reif said. "We're doing this by using water utility data and average

consumption rates to determine total lifetime doses. Our theory is that dogs exposed to higher levels of chlorination by-products in the drinking water will have a greater incidence of bladder cancer."

When water is disinfected with chlorine, the chemical reacts with organics in the water, leaving hundreds of by-products behind. When animals, or people, drink their city water, these suspected carcinogens eventually reach the bladder where there can be a lengthy contact time. In this way, the bladder acts as a sensitive indicator of environmental carcinogens.

But whether chlorination by-products increase cancer risk is a topic of great debate. Town and city water systems vary greatly in the amount of chlorination by-products in water, so the

concern is that water containing high levels of contaminants may be especially suspect. Part of the problem is that adequate studies have not been conducted to determine safe levels of these by-products.

"We did one of the first three human



*Dr. John Reif*

studies using similar methods to examine water disinfection by-products and bladder cancer risk," Dr. Reif said.

"Worldwide, fewer than 10 studies of this type have been conducted in this area. But even that small amount of research prompted the federal government to lower the parts-per-billion allowable from 100 to 80 parts-per-billion."

By identifying and quantifying the environmental culprits that set the stage for normal cells to begin their Dr. Jekyll and Mr. Hyde transformation, Dr. Reif hopes that his work and that of others will better define safe exposure levels not only to chlorination by-products but also to other triggers that may increase cancer risks. ■

**"I am interested in the causation and prevention of disease by understanding the risk factors in our environment. If we can identify the risk factors for human and animal cancers, we may be able to mitigate and reduce exposure, aiding in the prevention of cancer."**

## Hyperthermia Offers Innovative Way to Improve Gene Therapy for Cancer

Treating cancer is a very tricky business. Physicians and veterinarians struggle constantly with the balance between destroying diseased cells while preserving normal cells. But most therapies, outside of surgery, are nondiscriminate, killing healthy cells along with cancerous ones. Refining cancer therapies may help patients not only survive cancer, but survive the cancer treatment itself.

Hyperthermia – raising cell temperature to fight disease – has long been under investigation at Colorado State as a treatment that, when combined with radiation therapy, offers an effective weapon against cancer. Researchers now are expanding the role of hyperthermia and investigating its use in conjunction with gene therapy to treat cancer.

“We have been working with hyperthermia for more than 13 years and have just been funded for an additional five years through the National Cancer Institute,” said Dr. Susan LaRue, an assistant pro-

fessor with the Department of Clinical Sciences. “Our new studies focus on using hyperthermia as a method of gene therapy delivery.”



*Dr. Susan LaRue, right, examines a patient at the Veterinary Teaching Hospital.*

Dr. LaRue said that scientists have known for a long time that hyperthermia works very well when combined with radiation to treat cancer. Hyperthermia treats cells in a different stage of the cell cycle, complementing radiation treatment. Studies at Colorado State have focused on determining effective dose levels for hyperthermia treatment. The first clinical trial that looked at clinical dose of hyperthermia was conducted here, and that study is in its last phases.

The new study looks at hyperthermia as a pri-

mary treatment with radiation, as well as a method of gene therapy delivery. The study is focusing on cats with vaccine-associated sarcomas, a rare complication from rabies and feline leukemia vaccines.

“In hyperthermia, a microwave-like device is placed on top of or around the tumor and used to heat the tumor,” Dr. LaRue said. “We monitor the temperature in and around the tumor to deliver an accurate heat dose, measuring temperatures with special catheters.”

In the new study, researchers use a virus to introduce the interleukin-12 gene into cells. The catch, and where hyperthermia comes in, is that using heat-shock proteins as a trigger activates the IL-12. Without heat, the IL-12 is not activated. In this way, treatment with this particular gene therapy can be highly localized to the tumor cells, putting nominal numbers of

normal cells at risk. A parallel project in dogs looks at soft tissue sarcomas and uses chemotherapy stored in liposomes that are heat-released.

Dr. Mark Dewhirst of Duke University, who received his Ph.D. and D.V.M. from Colorado State, is heading the gene therapy study. Dr. LaRue also is working with Dr. Don Thrall, who also did his Ph.D. work at Colorado State and is now at North Carolina State.

“It’s a real privilege to work with these people and collaborate with them and the National Cancer Institute on such an important project,” said Dr. LaRue. “I hope that the work we do not only will have a positive impact on the cancer treatment options for our companion animals, but for people, as well.” ■

**“We have been working with hyperthermia for more than 13 years, and have just been funded for an additional five years through the National Cancer Institute. Our new studies focus on using hyperthermia as a method of gene therapy delivery.”**



## Healing Today While Developing Tomorrow's Cures a Fulfilling Mix for Faculty Member

When Dr. Susan Lana treats a cancer patient, her mission is twofold; first, to provide the finest care possible and, second, to learn as much as she can from each patient to further advance the progress of cancer care at the Colorado State University Veterinary Teaching Hospital.

Many of Dr. Lana's patients also take part in studies that evaluate the efficacy of new drugs and other therapies. This combining of missions, part of the overarching goals of the Animal Cancer Center, ensures that today's patients get the best care available while developing new therapies that may contribute to more effective cancer treatment in the near future.

"The care of the patient is always our top priority," Dr. Lana said. "Patients get the gold standard when taking part in studies, as well as additional new therapies that are undergoing testing. It's very exciting for faculty members here to be able to have such an impact on the individual animal as well as advance the cause of cancer care for all companion animals."

Currently, Dr. Lana is working on a drug study with Dr. Greg Ogilvie, who is the study's principle investigator. The study, funded by a major drug company, involves dogs with osteosarcomas and lymphomas. Researchers are testing an enzyme that blocks angiogenesis – a tumor's ability to develop its own blood supply. Angiogenesis is important in wound healing and during pregnancy, but when unregulated, problems arise. Angiogenesis is necessary for a tumor's survival. Inhibiting or stopping angiogenesis is one way to stop cancers from growing.

During the clinical trial, now in its third year, patients receive standard care and then either the drug or a placebo. The trial is double blind and randomized, meaning the researchers don't know which of their patients are receiving the drug and which are receiving the placebo. The multi-institutional trial, one of the largest veterinary trials ever done, is nearing its completion, and results of the study should be available soon.

Dr. Lana also is studying proteins that help cancer cells move from one part of the body to another, allowing the spread of tumors. If these proteins, specifically matrix metallo-proteinase

(MMPs), can be inhibited, there may be a therapeutic effect.

**"The care of the patient is always our top priority. Patients get the gold standard when taking part in studies, as well as additional new therapies that are undergoing testing. It's very exciting for faculty members here to be able to have such an impact on the individual animal as well as advance the cause of cancer care for all companion animals."**

"With cancer research, we are looking to refine our treatment techniques to ensure the best outcome for our patients with the least risk to healthy cells," Dr. Lana said. "It's a balancing act, but I am very excited about some of the new therapies under investigation here."

For Dr. Lana and the other clinicians at the Animal Cancer Center, the best balancing act is that of being not only doctor, but also a researcher. Their work enables them to have a long-lasting positive impact by expanding their ability to help tomorrow's cancer patients as they find ways to more effectively treat today's cancer patients. ■



*Dr. Susan Lana with her dog Sadie*

## Oncology Research Lab Testing New Ideas in Cancer Treatment

In a single sentence, Dr. Greg Ogilvie can weave together a treatise on cancer treatment that ranges from experimental drugs to nutritional therapy to complementary medicine. As director of the Medical Oncology Research Laboratory at the Animal Cancer Center, Dr. Ogilvie is a great proponent of combining the best therapies to benefit cancer patients at the Veterinary Teaching Hospital.

The laboratory, one of the best-funded research centers in the College of Veterinary Medicine and Biomedical Sciences with \$6.5 million in research grants over the past five years, prides itself in moving innovative treatment ideas from the laboratory to the clinic. Nutritional and drug studies comprise the bulk of the laboratory's work, and the laboratory's director also has been instrumental in developing the Animal Cancer Center's complementary medicine program.

"We have two main missions here. First is to provide the very best care for patients and to provide support, education, and understanding for the wonderful people who bring these animals to us," Dr. Ogilvie said. "And second is to document and quantitate how therapies work and if they work. Throughout the wide range of projects with which we are involved, the health and well-being of our patients is always our primary concern."

In drug therapy, the Medical Oncology Research Laboratory is looking at many of the new anti-cancer drugs that work on molecular mechanisms to fight cancer cells.

Currently, the laboratory's primary project is the clinical trial of an enzyme

**"We are looking at refining cancer treatment so that it is less traumatic to the whole body."**

that may inhibit tumor growth by cutting off blood supply (see related story on page 9). Dr. Ogilvie is the principle investigator for the enzyme study, which is the largest multi-institutional study in the history of veterinary medicine.

"Most of my work focuses on this study," Dr. Ogilvie said. "We are investigating a new cancer treatment modality that literally can change the way cancer is treated in human and veterinary medicine.

"We are looking at refining cancer treatment so that it is less traumatic to the whole body. New drugs are being developed that have reduced side effects while delivering a more potent punch. Many of these work by cutting off the survival mechanisms tumor cells need to exist in the body. I think we are going to see some incredible advances in drug therapy in the coming years, and I am very excited about what that means for our patients."

Nutrition studies also are an important part of the laboratory's work. These studies, ongoing for more than 13 years, have resulted in two patents and the creation of cancer diets now marketed worldwide by Hills Pet Nutrition.

"Cancer puts patients and their nutritional profiles in an abnormal state," said Dr. Ogilvie. "With these special diets, we can help patients normalize their nutritional profiles and create a positive healing environment for the body. Improving nutrient profiles may improve response to therapy, decrease toxicity of



*Dr. Greg Ogilvie with his dog Cocoa*

therapy to healthy cells, increase survival time, and enhance quality of life."

For example, glutamine, a study area in which Dr. Susan Lana works, is a nutrient essential for the health of the oral cavity and intestine. In cancer patients, glutamine levels are depressed. By bringing glutamine levels up to normal through nutrition therapy, veterinarians can improve an animal's health and reduce risk of complications from cancer therapy. Double-blind studies are used to evaluate the efficacy of nutrient mixes, and research is ongoing into improving current cancer diets and developing new ones.

Dr. Ogilvie said his prime interest overall, and the thrust of the Medical Oncology Research Laboratory, is to develop new therapies that provide effective, nontoxic treatments for cancer.

"With hope and help from science and the heart, I think we can do it," Dr. Ogilvie said. "It's especially satisfying to think that what we do here will benefit pets and can be integrated into human health care to improve the standard of cancer care for people, too." ■

## Research Group Takes Aim at Breast Cancer

Dr. Leia Smith knows all about the importance of early detection of breast cancer. One in eight women will develop breast cancer in their lifetime, with risks increasing as women age. Dr. Smith lost an aunt to breast cancer, and a friend was diagnosed three years ago. This prevalence of breast cancer helped guide her scientific endeavors.

"I always have been interested in cancer research," said Dr. Smith, who is an assistant professor in the Department of Radiological Health Sciences. "But once it gets that close to you, it really affects you. I wanted to do more to help understand, prevent, and treat breast cancer."

Dr. Smith hopes her basic research will have an impact on some of the challenges presented by breast cancer. One of the most tangible benefits of basic research in cancer biology is the understanding of the malignant transformation process that will allow the design of targeted therapy. Aside from surgical excision of the tumor, currently available cancer treatment is, in general, toxic to the patient and needs to be more specific to the cancer cell. Targeted therapeutic agents will reduce harmful side effects and

lead to more effective cures.

"Cancer is made up of a hundred diseases, and it's such a complex problem, we have to take it on in small pieces," Dr. Smith said. "I think of it as trying to move a big mountain – we take it one stone at a time."

Moving that mountain takes a team, and Dr. Smith seeks support from other cancer researchers, including those at the Animal Cancer Center, her laboratory's research team, and fellow faculty members with the College and across campus. She and her colleagues coordinate efforts to make the most of resources and expertise, taking data developed from basic research and moving into an applied setting. Dr. Smith has formed a Breast Cancer Affinity Group to bring together all researchers involved or interested in breast cancer studies. Now 20 strong, she hopes their combined efforts will lead to a greater impact than their individual endeavors.

Dr. Smith, who joined the University in June 1999, has three research projects in the works. Her laboratory's current focus is on the protein called cJun. This protein regulates the expression of genes involved in cell growth, cell death, and transformation into a cancer cell. In breast tumor cells, cJun levels are reduced. Dr. Smith wants to understand the interactions of this protein with another protein, P53, that acts as a tumor suppressor.

"Turning off or mutating P53 in normal cells allows for tumor growth, and the cell begins a transformation process," Dr. Smith said. "We want to understand at a molecular level what that process is and begin to unravel the threads to see where they lead. We

**"I always have been interested in cancer research. But once it gets that close to you, it really affects you. I wanted to do more to help understand, prevent, and treat breast cancer."**

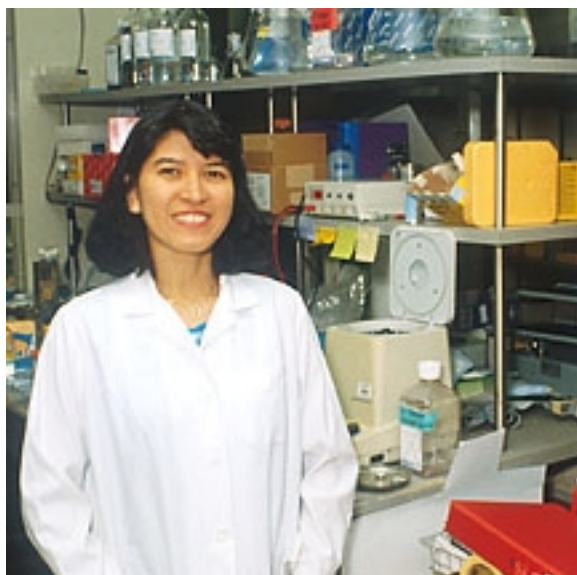
want to understand the role of cJun in regulating P53 and what happens when cJun is reduced as well as when levels are increased."

A Department of Defense Concept Award funds Dr. Smith's second study, scheduled to begin next month. This award provides funding for one year, based on a concept proposal.

"The DOD received almost 1,800 applications for these awards and only 68 were funded," Dr. Smith said. "So we are very pleased to have been selected. What this award allows us to do is try out a project that just might be worth a shot. We don't know where it will lead, but I hope we can get some answers this year."

The Concept Award will fund a study to identify novel – previously undescribed – tumor suppressor genes in breast cancer. The third project, funded by the College Research Council, will look at the effects of gamma radiation on the normal development of the mouse mammary gland.

For Dr. Smith, these studies and thousands like them around the world exemplify the essence of all cancer research – understanding cancer by defining the many small processes that happen in a normal cell, in a tumor cell, and in a cell's transformation from normal to malignant. By defining and understanding each protein, each enzyme, each process, the cancer mountain eventually will be moved, stone by stone by stone. ■



*Dr. Leia Smith in her laboratory at the Molecular and Radiological Biosciences Building.*

## Paws for a Cause Takes on Cancer

If you would like to join the Animal Cancer Center in its battle against cancer, please consider a donation to the Paws for a Cause campaign. The following information will provide a brief look at what Paws for a Cause is, how we function, and what we hope to accomplish. A number also is listed for additional information.

### **What is Paws for a Cause?**

Paws for a Cause is a national campaign to raise awareness of cancer in companion animals and raise money to help fight cancer in companion animals. The campaign benefits the world-renowned Animal Cancer Center (ACC) at Colorado State University.

### **How will the money be used?**

Cancer is a leading disease-related killer of dogs and cats. Donations to Paws for a Cause will be used to expand and enhance cancer treatment, research, and teaching programs at the Animal Cancer Center. Expansion of these efforts will enable veterinarians around the world to improve care and treatment, enhance quality of life, and extend life in companion animals with a cancer diagnosis.

### **How much money is needed?**

The overall goal of the Animal Cancer Center's fundraising campaign is \$10 million.

### **Why does the Animal Cancer Center need additional funding?**

Over the years, the Animal Cancer Center has grown from a small veterinary service unit to a major treatment, research, and outreach center. The ACC needs more space for treatment rooms, diagnostic facilities, continuing education programs, and other critical Center operation elements. The ACC needs additional faculty and

staff to handle patient, research, teaching, and outreach demands. The ACC needs funding for innovative projects that may offer new and exciting treatment options for difficult cancers.

### **How will Paws for a Cause raise money?**

ClayPaws,™ the original clay paw-print kit developed at Colorado State University, is used by many of the staff at the

Veterinary Teaching Hospital to make paw prints of beloved pets for clients. These paw print kits now are used as incentive items for gifts to Paws for a Cause from the general public. With a donation of \$50 or more, donors will receive a ClayPaws™ kit to make a paw print of a beloved pet.

### **How can I find out more?**

To make a donation to Paws for a Cause, or if you would like to receive ad-



ditional information about the Animal Cancer Center, call our toll-free number at 1-877-4CSUVET (1-877-427-8838) or visit us online at [www.cancercure.colostate.edu](http://www.cancercure.colostate.edu) Thanks!

*Paws for a Cause is used with the permission of Paws with a Cause, a Michigan-based organization that trains assistance dogs. The Animal Cancer Center thanks and recognizes Paws with a Cause for its willingness to share the Paws for a Cause concept for the duration of this campaign. ■*

## Flint Foundation Gives \$3 Million to Animal Cancer Center

Plans to build a much-needed new wing onto Colorado State University's Veterinary Teaching Hospital have become a reality, thanks to a gift of \$3 million from the Flint Foundation of Bloomfield Hills, Michigan. The gift is the largest single cash donation made to the College of Veterinary Medicine and Biomedical Sciences.

Groundbreaking for the new Animal Cancer Center wing is scheduled for June 2001. The new wing, to be called the Robert H. and Mary E. Flint Animal Cancer Center, is planned as a 32,000-square-foot, two-story facility to be added to the existing Veterinary Teaching Hospital on Drake Road in Fort Collins. The center will be dedicated to cancer research, teaching, and treatment programs.

Mrs. Flint and her late husband, Robert H. Flint, made the gift in memory of their two Labrador retrievers, Anna and Eve, who were treated at the Animal Cancer Center.

"The work being done at the Animal Cancer Center is vitally important. With more space they will have more capability for continuing to make advances in this field," said Mary Flint from her home in Michigan. "This is a wonderful way to honor the memory of my husband and offer support to the dedicated team of veterinarians, researchers, and staff at the ACC."

Robert and Mary Flint were longtime clients and friends of the Animal Cancer Center. Dr. Stephen Withrow, chief of oncology and professor of clinical sciences at the center, treated their two Labradors for several different malignancies over a period of nine years.

"The Flint's generous donation has made it possible to get started on making this longtime dream a reality," Dr. Withrow said. "Many of the treatments we develop for cancers in dogs have direct applications to treating cancers in humans. With more space, better and newer equipment, more personnel and the retention of those who have made such valuable contributions over the years, we think we'll be able to move closer to our goal of defeating cancer in animals and humans."

Since November of last year, the Animal Cancer Center has been engaged in a national awareness and fundraising campaign, "Paws For A Cause." The campaign will continue through the end of the year, focusing on raising the additional money for construction, new equipment, educational programs, and personnel. Private contributions will fund the entire project. All donations are tax deductible.

The new wing will house the Animal Cancer Center, the Argus Center, which focuses on the human aspects of veterinary medicine, and a center for professional medical training and patient treatment in complementary medicine.

H. Howard Flint founded Flint Ink Corporation in 1920 in Detroit, Michigan. Mr. Robert Flint served as Chairman and CEO of the company until his retirement in 1992. The company provides printing inks for newspaper, directory, magazine, packaging, and other printing applications to customers on six continents. Flint Ink operates nearly 100 facilities in the United States, Canada, Mexico, Europe, Central and South America, and Asia. ■

## Continuing Veterinary Medical Education

Please call the Department of Clinical Sciences at Colorado State University at 1-800-457-9715 or (970) 491-8373 for further information on all course offerings. Courses are sponsored by the Department of Clinical Sciences and the Colorado Veterinary Medical Association.

For the Equine Sciences Continuing Education Schedule, contact the Equine Sciences Program, Colorado State University, Fort Collins, CO 80523; (970) 491-8373; Web address: [http://www.colostate.edu/depts/equine/continuing\\_ed/index.html](http://www.colostate.edu/depts/equine/continuing_ed/index.html).

### September 2000

#### September 7-8, 2000 • Equine Dentistry

**Instructors:** Dr. Pat McCue, Dr. Jack Easley, Dr. Leon Scrutchfield  
**Cost:** \$500 non-CVMA member; \$450 CVMA member (lecture and lab)

This program will consist of a lecture and slide demonstration on anatomy and physiology of the mouth, including examination of the mastication process, procedures for floating teeth, removing wolf teeth, removing retained deciduous premolars, creating bit seats, treating malocclusion and abnor-

mal wear, hook removal, dental extraction, incisor realignment, leveling teeth, cutting teeth, and the use of power tools. In the laboratory, groups of three to four veterinarians will work closely with the faculty in gaining hands-on training to perfect their skills in equine dentistry using cadaver skulls and live horses. The latest dental equipment will be exhibited or demonstrated. In addition, participants are requested to bring their own dental equipment so that the best way to use it can be demonstrated.

#### September 13-15, 2000 • Small Animal Cardiology

**Instructors:** Dr. E. Christopher Orton, Dr. Janice Bright, June Boon  
**Cost:** \$450 non-CVMA member; \$405 CVMA member

This course will cover basic and advanced diagnosis and management of cardiac conditions of dogs and cats. Afternoon laboratories will include training in echocardiography, ECG interpretations, and case discussions.

#### September 21-24, 2000 • Basic Course in Acupuncture

**Course Chairperson:** Narda G. Robinson, DO, D.V.M.

**Course Faculty:** Drs. Allen Scan (author and editor of many books including

*(Continued on page 14)*

## C ontinuing Veterinary Medical Education

(Continued from page 13)

*Veterinary Acupuncture – Ancient Art to Modern Medicine and Love, Miracles and Animal Healing*), Cheryl Schwartz (author of *Four Paws, Five Directions*), Narda Robinson, Peggy Fleming, Mark Mattison, David Jagger, James Gaynor, and others.

**Cost:** \$3500. The course is open solely to veterinarians.

Veterinary acupuncture as a treatment modality has gained increasing respect and popularity among veterinarians and clients. The Colorado State University Basic Course in Acupuncture offers a balanced presentation of contemporary biomedical scientific and traditional Chinese approaches to acupuncture. It presents the fundamentals of acupuncture theory, channel and point location, approaches to diagnosis and therapy, and needling techniques in small and large animals. The format encourages veterinarians to creatively adapt acupuncture into their general and specialty practices and unique clinical environments.

The course is organized into five sessions that involve didactic lectures, supervised point-finding laboratories, demonstrations, and small group discussions. All participants must attend all sessions and laboratories. Participants will receive a certificate at the completion of the course stating that they attended the course and received 140 hours of continuing education. Graduates of the course will be well prepared to pursue certification through the International Veterinary Acupuncture Society (IVAS) should they so desire. Arrangements for certification must be made through IVAS, as CSU has no role in the IVAS or in any other certification process, other than to ensure that the acupuncture training program meets IVAS standards.

**Refunds:** CSU reserves the right to cancel the course or any of its sessions and to change the dates and venue of the sessions. A full refund is given if the course is canceled, discontinued, or rescheduled. A nonrefundable deposit of \$500 is required to reserve a seat in the course, and two additional non-refundable payments of \$1500 are required by dates available through the office of Continuing Education. No fees are refundable after the start of the program.

### October 2000

#### October 12-13, 2000 • Small Animal Laparoscopy

**Instructor:** Dr. David Twedt

**Cost:** \$565 (if received two months prior), \$590 (if received one month prior), \$615 (if received month of course)

**Lecture Only:** \$200 (lecture only)

**Technicians:** \$200 (attend lecture and observe lab)

A nine-hour short course introducing the small animal practitioner to the indications and technique of laparoscopy. The course will include five hours of lecture and "Black Box" training, followed by a four-hour, hands-on laboratory, in which participants will perform laparoscopy on dogs. Participative demonstrations of thoracoscopy also will be presented in the lab. Total CE hours = 9.

#### October 18-20, 2000 • Current Topics in Feline Medicine

**Instructors:** Dr. Dave Twedt and various Colorado State University faculty

**Cost:** \$450 non-CVMA member; \$405 CVMA member

This course will provide discussion in selected areas currently relevant to feline medicine.

The intent will be to provide clinically useful, practical information in the following subject areas: endocrine and metabolic diseases, dermatology, cardiology, urology, oncology, reproduction, neurology, and infectious diseases.

### November 2000

#### November 8-9, 2000 • Flexible GI Endoscopy

**Instructor:** Dr. David Twedt

**Cost:** \$525 (if received two months prior), \$550 (if received one month prior), \$575 (if received month of course)

**Lecture Only:** \$200 (Wednesday)

**Technicians:** \$200 (attend lecture and observe lab)

A perfect introduction or refresher including indications, instrumentation, and technique. Five hours of lecture are followed the next day by four hours of wet lab, providing hands-on experience in upper GI endoscopic exam, PEG tube placement, and foreign body retrieval. Total CE hours = 9.

#### November 10-11, 2000 • Canine Arthroscopy

**Instructors:** Dr. Timothy McCarthy, Dr. Jean Francois

**Cost:** \$750 (if received two months prior), \$775 (if received one month prior), \$800 (if received month of course)

This seminar presents a thorough and practical overview of canine arthroscopy of the shoulder, elbow, and stifle. Indications, instrumentation, and technique will be team-taught by two world-renowned small animal surgeons who perform canine arthroscopy on a routine basis in their practices. Six hours of lecture will be followed the next day by a five-hour practical lab. Total CE hours = 11.

### December

#### December 6-7, 2000 • Management of the Acute Abdomen in the Horse

**Instructors:** Dr. Ted Stashak, Dr. Josie Traub-Dargatz, Dr. Gary Baxter, Dr. Dean Hendrickson, Dr. Ann Wagner

**Cost:** \$600 non-CVMA member; \$540 CVMA member

The clinical evaluation of the acute abdominal patient leading to a decision whether medical treatment or surgical intervention is required will be reviewed. Medical and surgical therapy will be discussed with specific emphasis on selection of drugs, preoperative patient preparation, anesthesia, intraoperative findings, postoperative care, and complications. Indications for the use of surgical stapling will be reviewed and the techniques illustrated.

The laboratory will include application of techniques that are used in the clinical evaluation and treatment of an acute abdominal patient. This will be followed by a thorough review of surgical anatomy on a cadaver. The decision for surgical intervention, selecting anesthetic regimens, selection of laparotomy approach, and correction of the intraabdominal lesions are included. Each participant will have the opportunity to thoroughly explore the abdominal cavity and perform an enterotomy for emptying the large colons, an intestinal resection anastomosis, and other procedures they wish to perform. A demonstration of the use of surgical stapling equipment for resection and anastomosis of the large and small colon will be included.

## Continuing Veterinary Medical Education

### Special Programs for Veterinarians

#### Small Animal

Dates individually arranged – \$500 per week  
40 hours of CE  
(\$450 per week CVMA members)

Cardiac Ultrasound

Communicating Effectively with Emotional Clients

Critical Care and Emergency Medicine

Small Animal Surgery

#### Food Animal

Dates individually arranged – \$150 per day  
8 hours of CE

Bovine Calving Management

Reproductive Management

Male Reproduction

Bovine Nutrition

(or combinations above)

### Technician Programs

Dates individually arranged – \$200 per week  
20 hours of CE

Small Animal Surgical Assisting

Large Animal Surgical Assisting

Critical Care and Emergency Medicine

Clinical Pathology and Diagnostic Parasitology

Anesthesia

Necropsy

*Programs can be customized to meet individual needs.*

*For further information and to set up special veterinarian or technician programs, call 1-800-457-9715.*

*E-mail [denglebe@vth.colostate.edu](mailto:denglebe@vth.colostate.edu) and check our Web site for updated information at [www.cvmb.colostate.edu/clinsci/ce](http://www.cvmb.colostate.edu/clinsci/ce).*

*All continuing education courses have enrollment limitations. If the minimum enrollment is not reached three weeks prior to the scheduled date, the course will be canceled. For information on additional equine course offerings, please call (970) 491-8509.*

## Foundation Provides Grant to Equine Researchers Looking at Early Markers of Catastrophic Injury

Bone fractures, joint injury, and other musculoskeletal trauma are major problems in the equine industry. In response, a grant of \$59,700 will help two Colorado State University equine researchers continue their studies into diagnosing, monitoring, and potentially preventing these problems.

Dr. David Frisbie and Dr. Clark Billinghamhurst of the College's Equine Orthopaedic Research Laboratory are studying a method of early detection of musculoskeletal injury by monitoring serum markers in equine blood samples. Early studies conducted at the lab were successful enough that the prestigious Grayson-Jockey Club Research Foundation grant was awarded to Drs. Frisbie and Billinghamhurst to continue this research.

Dr. Frisbie reported results from previous studies on a small population of horses that showed he had been able to accurately predict (79 percent of the time) the presence of a chip fracture in the knee, based solely on a blood sample.

"The hope of this study is to identify levels of serum markers that may be as-

sociated with an increased risk of bone and/or cartilage injury," said Dr. Billinghamhurst. "This early diagnosis will allow therapeutic intervention prior to a real problem, thereby saving the horse from a career- or life-ending injury."



Drs. Billinghamhurst and Frisbie will collect monthly blood samples from 200 2- and 3-year-old Thoroughbred racehorses in training in California throughout the 2001 racing season. The attending veterinarians collecting the samples also will record any indications of musculoskeletal injuries and the date of occurrence within the test season. Drs.

Billinghamhurst and Frisbie will assess the levels of bone and cartilage markers to help predict the onset of structural and functional changes that ultimately lead to musculoskeletal injury.

Bone fractures and osteochondral lesions are significant causes of fatalities at racetracks around the world. In one study, 83 percent of fatalities at California racetracks during a two-year period were linked to musculoskeletal injury. Although some diseases of the bone and cartilage can be diagnosed using routine clinical methods, equine practitioners have been limited in their ability to diagnose such problems until after considerable injury has occurred.

The Grayson Foundation was established in 1940 to raise support for the promotion and funding of equine veterinary research. In 1989, resources were combined with the Jockey Club Research Foundation. Since then, the foundation has distributed more than \$6 million to projects aimed at enhancing the health and safety of horses. ■

## G raduates Inducted into Equine Hall of Fame

Drs. William Moyer, George Platt, and Jan Young, all graduates of the Colorado State University Professional Veterinary Medical program, have been inducted into the International Equine Veterinarians Hall of Fame for outstanding dedication to hoof care.

The Hall of Fame was created in 1997 by the American Farriers Journal and Kentucky Derby Museum to recognize veterinarians who have contributed to the knowledge and recognition of proper hoof care for horses. Only six veterinarians nationwide have been honored by this recognition to date. Current members of the International Horseshoeing Hall of Fame select inductees.

Dr. Moyer, a 1970 Colorado State alumnus, has focused his career on the musculoskeletal system of the horse with an emphasis on the foot. Through his teaching and research at the University of Pennsylvania and Texas A & M University, Dr. Moyer has introduced and advanced many techniques in farriery. Dr. Platt, of Eagle, Colorado, is a 1962 Colorado State alumnus in private practice who has spent considerable effort researching founder and laminitis in the field. Dr. Young, a 1980 graduate of the PVM program, practices in Black Canyon City, Arkansas, and is a world-renowned equine veterinarian as well as certified farrier. She works with professionals and students to advance the farrier industry and has written many papers on hoof disorders.

The College congratulates Drs. Moyer, Platt, and Young on their induction into the International Equine Veterinarians Hall of Fame. ■

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