

Arkeology

AUTUMN/WINTER '06

News and trends on veterinary medicine and the human-animal bond.



Clover's Comeback

Almost Beaten to Death and Left on the Side of a Road to Die, a Puppy Gets a Shot at a Pain-Free Life and Lives as an Example Against Animal Cruelty

Clover, a young Staffordshire Terrier mix, is happy to see everyone. She eagerly wags her tail and gives wet doggie kisses to strangers. She must be the most forgiving of dogs considering what someone did to her. As a puppy, Clover was abused over time.

When she arrived at the St. Charles (Mo.)

Humane Society (SCHS) in March, nine of her ribs had been fractured. Three of her four legs were shattered, the back ones both above and below the knees. The trauma to her legs had been so bad that the balls of her hips were snapped off.

A couple found Clover next to a trash heap along the side of a road, said SCHS executive director Jill Allen. "They thought she was dead, until they saw her move."

Sharon Maag, one of the first SCHS volunteers to see Clover, could hardly tell she was a dog. In addition, Clover was severely underweight from starvation. Her broken ribs distinctly showed through her thin skin.

"Everyone at the shelter was furious," Ms. Allen said. "We kept saying, 'This better have been done by a car.' But even before we got her to the veterinarian, we knew better."

Although the SCHS is a no-kill shelter, there are times when euthanasia is a final act of mercy. While a veterinarian examined Clover, Ms. Allen was afraid she would be told that the kindest action would be to put Clover to sleep.

It was an option that she didn't want to take. Clover could be fed and nursed back to health in many ways, but the leg and hip injuries were incredibly severe. Still, euthanasia, even as a humane remedy, seemed like the final insult against Clover by her tormentor.

Dr. Terri Sympson, the examining veterinarian and a 2004 graduate of the University of Missouri College of Veterinary Medicine, agreed with Ms. Allen that despite Clover's extensive injuries, the tough little puppy deserved one good shot at a normal life. The dog's injuries, frankly, were beyond conventional clinical techniques.

Dr. Sympson remembered during her coursework the successes that MU's veterinary orthopedic surgeons had in treating seemingly impossible cases. These veterinarians were tapped, from all similar specialists in the country, to replace the hips of an endangered snow leopard so that he could help repopulate the species. A greyhound born with malformed front legs was heading for euthanasia himself until the Mizzou surgeons developed a new way to mend the dog's twisted and bowed legs. That dog today happily romps around a Kansas farm.

Since the most dangerous injuries were to Clover's leg and hips, she conferred with her old teachers who agreed to give the dog that one good shot.

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Our Mission

Because animals are more important today than ever before in our history, the University of Missouri-Columbia College of Veterinary Medicine is dedicated to preserving, protecting, and strengthening the human-animal bond. *Arkeology*, as its name implies, is a medium for bridging between the role of the College as a protector of the animal kingdom (a kind of modern ark) and as a place where science, medicine, learning, and teaching can flourish (*logia* is the old Latin and Greek word for study or discipline). Continuously embarking on voyages of teaching, healing, and discovery, the College invites you on board this vessel to journey with us.

P R E V I E W S

Project HOPE

Abandoned animals living in urban areas live short and cruel lives. A volunteer team from the University of Missouri Veterinary Medical Teaching Hospital uses a variety of rented trucks to make monthly trips to Kansas City to aid shelter veterinarians there. Soon, a new resource may help this effort—a surplus police bus.

Predicting Osteoarthritis

Osteoarthritis has plagued mankind for eons. There are few medical options once cartilage degrades and bone grinds against bone. A unique MU laboratory is investigating a way to predict the onset of this disease before the damage occurs—allowing veterinarians and physicians to take action that will stop the tissue destruction from ever occurring.

Eradicating Disease

With every passing day, the news media reports on an outbreak of a new disease, the spread of a disease thought to be under control, or the emergence of an antibiotic-resistant strain of an organism. Supported through an endorsement from an MU alumnus, one MU scientist is investigating the fundamental causes of how microorganisms trigger diseases and how to develop new strategies to deal with them.



Dr. Terri Sympson, MU College of Veterinary Medicine class of 2004, was the first veterinarian to see Clover and recommend her surgery.



Friendship, New Challenges, and Going Home

Arkeology was conceived in 1998 as a College publication that would celebrate the magical relationship between people and animals. We wanted to also ensure that its stories would bring attention to the educational mission of the College. Much of our initial discussion centered around what we should call this special publication. When *Arkeology* was suggested, the debate, in my mind, was over. It felt right then and still does.

Since *Arkeology's* inception I've provided eight columns dealing with a range of subjects. This ninth column, *Friendship, new challenges, and going home*, will also be my last as dean. In an e-mail message to College faculty, staff, and students on August 24, I announced plans to accept a new position, effective October 15, at the University of North Carolina-Chapel Hill. My principal appointments will be through their Gene Therapy Center and the School of Medicine's Department of Pathology and Laboratory Medicine. This new appointment will allow me to focus efforts on research involving a canine model of Duchenne muscular dystrophy. Research in which I have been

involved for 25 years. This will also be a homecoming. I was born and raised in North Carolina and later spent 11 years on faculty at the College of Veterinary Medicine at North Carolina State University. My daughters, Kristin and Lindsay, were born in Raleigh.

Naturally, with my previous eight columns, there have been recurring themes. One, in particular, has been the special role that friends play in our own personal lives and the life of the College. The inaugural column, *It helps to have friends*, acknowledged contributions that special people have made to the College's success. I've often said that the best part of being dean is the people you meet. And, people like Virginia Florman, Bud and Betty Hertzog, Ken and Barb Levy, Tom and Betty Scott, Jim Nave, and Thelma Zalk are as good as they come. Yes, they are very special friends.

In keeping with the name *Arkeology*, several subsequent columns have celebrated the human-companion animal bond, as we have recognized that our best friends sometimes have four legs. The third column was particularly

noteworthy, in that we brought attention to a new College program, *The Center for the Study of Animal Wellness*. Established jointly by College faculty Richard Meadows and Rebecca Johnson, this Center has had two overarching missions. Dr. Meadows' work has focused on critical issues facing animals in society. Perhaps, none is more serious than pet overpopulation. It's appropriate, therefore, that our current issue of *Arkeology* includes an article on Dr. Meadows' efforts to alleviate this problem through the HOPE project. The second mission of the Center is addressed through Dr. Johnson's tireless efforts to better understand and extend benefits of the human animal bond. Again, it's fitting that in September, Dr. Johnson and others dedicated the new Research Center for Human-Animal Interaction (ReCHAI) to further expand this important work. The Winter/Spring 2005 column, *All creatures great and small*, also emphasized the role of animals in our lives, be they as large as Miracle, a sacred white buffalo, or as small as Lucifer, the tiny screech owl who couldn't fly.

My last column, *With a little help from your friends*, returned to the theme of the inaugural *Arkeology* issue, as we acknowledged once more contributions made by special people and animals. Contributions to the College, yes, but also to society as a whole.

Other columns have celebrated the College's recent progress and goals for the future (*The next step: Striving to be the best*); acknowledged accomplishments of our alumni (*Being admitted to the profession of veterinary medicine*); recognized the international scope of the human-companion animal bond (*Animals are special the whole world over*); and brought attention to the importance of philanthropy in building outstanding College programs (*The power of giving*).

In keeping with past *Arkeology* columns, I'd like to close by saying thanks to the College's many special friends for all that you have done to elevate our programs to world-class stature. And, on a personal note, thank you for the friendship you have extended to me over these past 13 years. You will always have a place in my heart.

DEVELOPMENT REPORT: GREG JONES



Alternative Ways To Support The College

If you anxiously await each issue of *Arkeology* as much as I do, you've probably wondered at one time or another, "How can I help the College in its continuing pursuit of improving animal—and human—health?" As you see in each issue of *Arkeology*, there is no shortage of ideas on how a gift to the College can positively impact these pursuits. Under the College's \$32.4 million For All We Call Mizzou (FAWCM) campaign goal, we have specific private-funding priorities that address Student, Faculty, Facility, and Programmatic needs. Often, though, someone that wants to help might not have the cash "in-hand" to immediately

do so. There are other ways to support the College, though. Ways which aren't always considered...

Current Gift. It won't surprise you to know that the College accepts gifts of cash which can be specifically designated to any College need. Did you also know that you can make a gift over time? By entering into a "pledge" with the College, you can spread your gift over a number of years (up to five) and still help us reach our FAWCM goal.

Gift of Appreciated Stock. In most cases, if a donor has appreciated stock, it makes more sense tax-wise to give the stock instead of cash. Usually, when appreciated stock is given, the donor gets a charitable deduction for the full fair market value of the stock AND the capital gains tax on the appreciation is avoided.

Life Insurance. Naming the College as the beneficiary (and, possibly, owner) of a pre-existing or new life insurance policy allows an individual to make a large gift with little up-front cost. Often policies purchased long ago for a specific purpose are no longer needed for that purpose. Changing

the beneficiary and owner of such a policy to the College may give you a current tax benefit – and help the College achieve its long-term goals.

Bequest in Will or Living Trust. Over 70 percent of people give to charitable purposes during their lives, but only 8 percent make a provision for their favorite charity in their Will or Living Trust. Consider giving a specific dollar amount or percentage of your estate to the College. With the right language, you can direct this to support a specific area of the College. If you will be 65 or older by December 31, 2008, AND you let us know the current estimated value of your gift, your bequest intention will count toward our FAWCM goal.

Retirement Plan Assets. Assets being passed to your descendants from your 401(k), IRA, or pension plan are often subject to multiple layers of taxation—sometimes as much as 90 percent of the assets will be eaten up by taxes. If you are considering an estate gift to the College, it often makes the most tax-sense to name the College (a tax-exempt organization)

as the beneficiary of these assets and give other assets to your heirs. (Note: The law on making current gifts from an IRA has recently changed. Contact us or your tax expert for details.)

These are just a few of the ways that you can help the College address issues of animal health and well-being. These gifts may also qualify you for membership in the following University and College "gift recognition" societies: The Jefferson Club, The Legacy Society, and The John W. Connaway Society.

Other Ways for Veterinarians to Help. Participate in the Pet Memorial Program (see back page), consider keeping material about the College in your clinic's reception area, and inform your clients about the good work of the College. There are many well-intended people who are supporting other causes that might find the work of the College more consistent with their true animal-health related philanthropic goals.

Finally, do not hesitate to let Lauren, Lisa, Kim, or me know how we can help (888) 850-2357.



There are only 80,000 veterinarians practicing in the U.S.

ProjectHOPE A New Tool to Prevent Animal Overpopulation and Suffering



Mizzou veterinary medical students get an early introduction to one of the most typical procedures in veterinary medicine, spaying and neutering of companion animals. They also become involved in giving back to their community.

Soon, an ex-police command bus that once rumbled to the worst problems in Cole County, Mo. may have a new mission. It is scheduled to become a mobile veterinary clinic to help control animal populations in the poorest areas of the state.

The vehicle, surplus by the county, is a veteran of natural disasters, hostage situations, and other times when significant on-site police coordination was needed. After refurbishment with operating tables, surgical support gear, and anesthesiology equipment, it will become a mobile clinic.

Once operational, the bus will be an important boost to the University of Missouri College of Veterinary Medicine's Project HOPE—Helping Overpopulation of Pets through Education. A self-contained rolling hospital, the bus will replace a mish-mash of rent-a-trucks used to get equipment to borrowed warehouses where the medical work is currently performed. Having a mobile clinic with all of its equipment in place and ready to go in minutes will allow hours' more time to perform the real mission of the effort—deliver medical care to animals.

Project HOPE, underwritten by grants from Hill's Pet Nutrition and the MU Student Chapter of the American Medical Association, has been in operation since early this year and works in coordination with a non-profit animal shelter named Spay-Neuter Kansas City. MU veterinary faculty Drs. Richard Meadows and Joann Kunz, with the help of students, other veterinarians, and lay volunteers, spay or neuter at least 100 dogs and cats during each visit. The team performs a host of other medical treatments to animals that come through the door when rare veterinary service comes to a poor neighborhood.

This project focuses on the lowest-income areas of Kansas City where there are few practicing veterinarians and many stray and under-cared-for animals. These areas are where animals live short and cruel lives.

"This partnership between HOPE program and Spay Neuter is a true win/win situation," says Dr. Meadows. "The animals and their owners benefit from the physical exams, vaccinations, parasite checks, heartworm

tests, dewormings, and sterilization that the animals receive—the veterinary students get much needed supervised experience at the two most common surgeries most of them will ever do. Last but not least, the veterinary students get to see how they can give back to their communities."

"A typical weekend trip starts with loading the equipment on Saturday evening and then leaving from the Veterinary College at 5 am sharp Sunday morning," Dr. Kunz added. By 7 pm Sunday night we are all back at the college feeling tired but gratified with what was accomplished."

In addition to the job of helping reduce the feral animal population, Project HOPE volunteers also work with overwhelmed local shelter veterinarians to improve the adoptability of animals, providing the animals with needed dental and medical care that could help them land stable homes.

A HOPE-Ful Project

MU's Project HOPE is run by not just any veterinarian. Richard Meadows, DVM and clinical associate professor of veterinary medicine at Mizzou's Veterinary Medical Teaching Hospital (VMTH), recently received the 2006 Bustad Companion Animal Veterinarian of the Year Award, one of veterinary medicine's highest honors. This national award recognizes the outstanding work of veterinarians in protecting and promoting the human-animal bond.

The recognition is not the first for Dr. Meadows. He was among 10 MU educators who won the 2005 William T. Kemper Fellowships for Teaching Excellence. Like the Bustad Award, Dr. Meadows had been secretly nominated by students and colleagues. Since arriving at MU in 1999, he has received the Norden Distinguished Teacher Award, the Aesculapius Teaching Award, and the Golden Chalk Award.

Dr. Meadows has a "passion for teaching," says his Kemper citation. He devotes 85 percent of his efforts to clinical teaching, and students identify him as "one of the best teachers in the college." One student said: "His enthusiasm is contagious and his sense of humor and light-heartedness uplifting."

"Dr. Meadows is the consummate clinical educator who has a deep understanding of the important relationships between people and animals and works tirelessly to impart this understanding to his students," reports Dr. Cecil Moore, MU VMTH director. "We are proud to count him as one of our outstanding faculty members."

Dr. Meadows is also the faculty advisor for MU's Pet Assisted Love and Support—PALS. Here, students and their pets visit children's hospitals, retirement homes, and other areas where the emotional well being of people are enhanced by interacting with animals. The Texas-born Dr. Meadows has also been involved with research into therapeutic benefits of the human-animal bond.

Although he considers teaching to be his primary responsibility, Dr. Meadows also actively seeks funding to enhance the college's teaching facilities and technologies. He has received more than \$445,000 in grants that have been used for a variety of projects including the purchase of specialized equipment for veterinary dentistry instruction.

The Cole County sheriff's bus will join a small fleet of similar efforts in the US. The idea behind non-profit mobile spay-neuter clinics is only a little more than a decade old. In 1993, the Houston Animal Rights team, later to become SNAP, the Spay-Neuter Assistance Program, pioneered the use of a mobile surgical facility to provide volume spay-neuter services exclusively to the pets of lower-income families in the Houston area.

Adding Style to Service

While getting the vehicle, making it safe, and outfitting it for its medical mission is the primary goal, Dr. Meadows has grander esthetic hopes for the bus. He is attempting to get one of the popular Cable TV programs, like County Music Television's Trick My Truck, interested in the project.

Such a connection will accomplish two things—help modify a vehicle designed for something else for efficient medical operation, and add a sense of style and élan that will draw attention to its critical mission.

After all, it's important to look cool when rumbling to a crisis. **Ark**



The Need to Control Animal Population

Animal overpopulation is the source of much suffering by dogs and cats left to fend for themselves in urban settings. Millions of dogs and cats suffer from starvation, malnutrition, untreated diseases and injuries, abandonment, and deliberate cruelty each year.

In the wilderness, overpopulation is solved by predators. Predators look for signs of weakness in their prey, and usually first eat the old or sick animals. This has the side effects of insuring a strong stock among the survivors, and controlling the population.

Overpopulation can occur unchecked in cities and towns as feral cats and dogs can live in the nooks and crannies of buildings and eat from dumpsters. There are few natural predators, save for the occasional animal control officer.

These animals can live poor lives, suffering with chronic painful injuries and disease. Through breeding, they also contribute to more homeless animals. According to the Humane Society of the United States, in six short years one female dog and her offspring can give birth to 67,000 puppies. In seven years, one cat and her young can produce 420,000 kittens.

In the US alone, at least four million cats and dogs are euthanized each year for lack of homes to adopt them, according to the Humane Society.

For more information about the MU College of Veterinary Medicine Veterinary Medical Teaching Hospital, see its web page at: www.vmt.h.missouri.edu
For information about helping support Project HOPE, contact Greg Jones, director of development, at 1-888-850-2357.

Forecasting ARTHRITIS

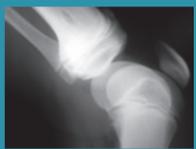
A MU Research Project Shows Early



Dr. James "Jimi" Cook

In addition to being an orthopedic researcher, Dr. James "Jimi" Cook is also a surgeon and director of the Comparative Orthopaedics Laboratory.

A Major Medical Problem



Arthritis refers to more than 100 different diseases that affect areas in or around joints. It is one of the most prevalent chronic health problems, the nation's leading cause of disability among Americans over age 15, and second only to heart disease as a cause of work disability. Arthritis limits everyday activities such as walking, dressing, and bathing for more than seven million Americans. Arthritis results in 39 million physician visits and more than a half million hospitalizations with costs to the US economy totaling more than \$86.2 billion annually.

Osteoarthritis, the most common of these diseases, is a degenerative joint disease in which the cartilage that covers the ends of bones in joints deteriorates without warning, causing pain and loss of movement.

OA affects nearly 21 million Americans. OA typically affects the hips, hands, knees, low back, and neck. OA symptoms typically begin after age 40 and progress slowly, but continually. After age 50, women are more often affected by OA than men.

Drs. Cook and Stoker decided to start their OA prediction research based on discoveries that indicate genetics may play a role in OA development. Scientists believe something in the body's genes changes, causing a series of events that eventually causes cartilage to break down. A genetic trigger seemed plausible as the destructive change appeared to be timed to begin at some point in a person's life.

Osteoarthritis (OA) is a painful joint disease that has afflicted humans for a long time. Autopsies of ice-age mummies have found evidence of cartilage destruction resulting in bone grinding against bone. Unfortunately, today's doctors have few practical interventions beyond pain control and lifestyle changes to slow the damage.

During a brainstorming session at the Comparative Orthopaedic Laboratory (COL), a group of young veterinary and human orthopedics specialists housed in the University of Missouri College of Veterinary Medicine, the question was asked why there was no way to predict the onset of this disease.

If physicians knew their patients were on a course to OA, they could recommend lifestyle changes before the disease even appeared, preventing the mechanical grinding from even starting. Patients could be preemptively prescribed pharmaceuticals known to slow cartilage degeneration. Researchers could develop new pharmaceuticals to interrupt the disease process.

The COL, only in existence since 1999, is an organization known not only for asking such questions, but pursuing answers.

Years ago, COL's director, Dr. James "Jimi" Cook, envisioned using biologically modified pig intestines to cure knee damage that had no previous effective treatment other than a reduced workload on the affected leg. To repair the knee's meniscus, a spongy material that acts as a shock absorber but is damaged by overuse or a severe rotation of the knee, Dr. Cook attached a layer of this material to whatever was left of the meniscus. The meniscus absorbed the new material and transformed into a new meniscus—quite a feat since the meniscus is normally unable to repair itself. First used on dogs with knee injuries, the minimally-invasive procedure is now undergoing national FDA trials on human patients.

As a surgeon, Dr. Cook was not adverse to taking on the hardest of orthopedic cases. He was tapped to perform the second-ever hip replacement on an endangered snow leopard.

He led an effort to use multiple orthopedic techniques to help a Kansas greyhound whose front legs had grown into an almost J-shape.

Dr. Cook's research and teaching abilities caught the eyes of his human medicine orthopedic colleagues at MU's School of Medicine who named him the first William C. Allen Distinguished Faculty Scholar—a unique honor for an assistant professor of veterinary medicine. That wasn't the only recognition by human medicine. In 2003 he earned the Orthopaedic Research Society's New Investigator Recognition Award—the first ever for a veterinarian.

Dr. Cook joined Dr. Aaron Stoker, the COL Robert B. Gordon Arthritis Research Fellow and expert in cartilage gene expression, to investigate the possibility of predicting OA. The pair knew that researchers were already looking at various predictive biomarkers in blood and other bodily fluids. Drs. Cook and Stoker wanted to find the earliest and most basic cause—the change in a person's genes that triggers a process resulting in OA.

Looking For Genetic Changes

To look for this genetic change, the team turned to one of the latest and most advanced techniques in science's arsenal. Called gene expression analysis, this laboratory test reveals how the genetic coding of DNA manifests itself in actual bodily changes. With this, changes in DNA expression that might lead to OA could be monitored.

There was one big problem—with a lifetime of 75 or more years for an average person, such DNA changes can take years in people. So the team looked at other patients, dogs, who also are predisposed to OA. Because of their shorter lifetimes, canine DNA changes can take only weeks to months. This made them ideal candidates to quickly assess any DNA changes.

Better still, pedigrees provide multi-generational family histories on dogs known to contract OA at a certain age. Watching healthy dogs before they show clinical signs of OA would position the team to see genetic changes

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Promise In Predicting the Onset of Osteoarthritis

For more information about the MU Comparative Orthopaedics Laboratory, see its web page at: www.columc.missouri.edu/
For information about helping to support the College's research efforts, contact Greg Jones, director of development, at 1-888-850-2357.

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as they happen. About a dozen of these dogs were gathered together in a happy colony of playful pups.

While the dogs romped around unaffected by OA, the MU researchers monitored the dogs' joint chemistry, tissues, and clinical function. They also kept track of the dogs' canine genome with a device called a microarray. This device allowed the researchers to monitor the cellular concentration of over 20,000 different messenger RNAs, the working part of the DNA.

The team had clues on which genes may trigger cartilage degeneration based on previous studies of the canine genome. They kept their eyes on these candidates, looking to see if changes in their expression could be directly correlated to clinical signs and symptoms of OA later in time.

Drs. Cook and Stoker added another sophisticated method to watch for the onset of OA in the dogs. In order to determine when the very earliest stages of OA developed in the joint, real time polymerase chain reaction (PCR) was performed regularly on the tissues of the joints to accurately monitor the expression of the suspected genes.

Soon, the first signs of suspicious genetic changes were noted in the blood and tissues. The dogs underwent a series of standard veterinary clinical evaluations for OA. These initial physical and arthroscopic exams and assessments, imaging and tissue samples, indicated nothing but normal and healthy cartilage.

The team continued to watch the genetic changes develop on their sophisticated DNA devices while monitoring the cartilage, even as the dogs continued to happily play and romp around the college. About two months after the first suspicious DNA activity, the equivalent of years in a longer-lived human, the first small clinical signs of OA began appearing in the dogs. In a few more months, the dogs were clinically afflicted with painful OA.

The results were small and early, but significant indications that a practical process to predict OA was possible.

Sixteen Suspicious Genes

When the team analyzed their results, they identified changes in 16 genes in the cartilage that seemed to occur before the onset of the disease.

After evaluating the data, COL members felt confident that their initial hypothesis was right—the OA process starts when DNA triggers the creation of a messenger RNA in cartilage cells. This RNA, in turn, creates a protein.

Such protein creation is not unusual. It happens all of the time in the body, and its effects can be either positive or negative, maintaining health or causing disease. In OA's case, the protein appeared to damage the cartilage like a corrosive, eventually leading to its destruction and the resulting problems of bones grinding against each other, pain, swelling, and disability.

The results were strong enough to publish and present the data in scientific orthopedic arenas and begin looking for funding for the next phase of research.

While a practical clinical way of predicting OA will not be a cure, such a capability will give physicians and veterinarians a welcomed tool to combat the problems of one of the oldest human diseases, even if it is too late for those ice-age mummies.

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Dr. Aaron Stoker

What is the COL?



Arthritis in dog

COL is made up of more than 25 scientists who are involved in the lab's research on osteoarthritis, tissue engineering, and

articular cartilage physiology. Members span the university, coming from the College of Veterinary Medicine, College of Engineering, and medical school. Using the expertise in the COL and collaborations with researchers from Virtual Scopics, LLC in Rochester, N.Y., Stoker and Cook are determining the extent of abnormal gene expression in the knees of dogs and correlating it to MRI results, a clinically relevant assessment of arthritis.



Arthritis in human

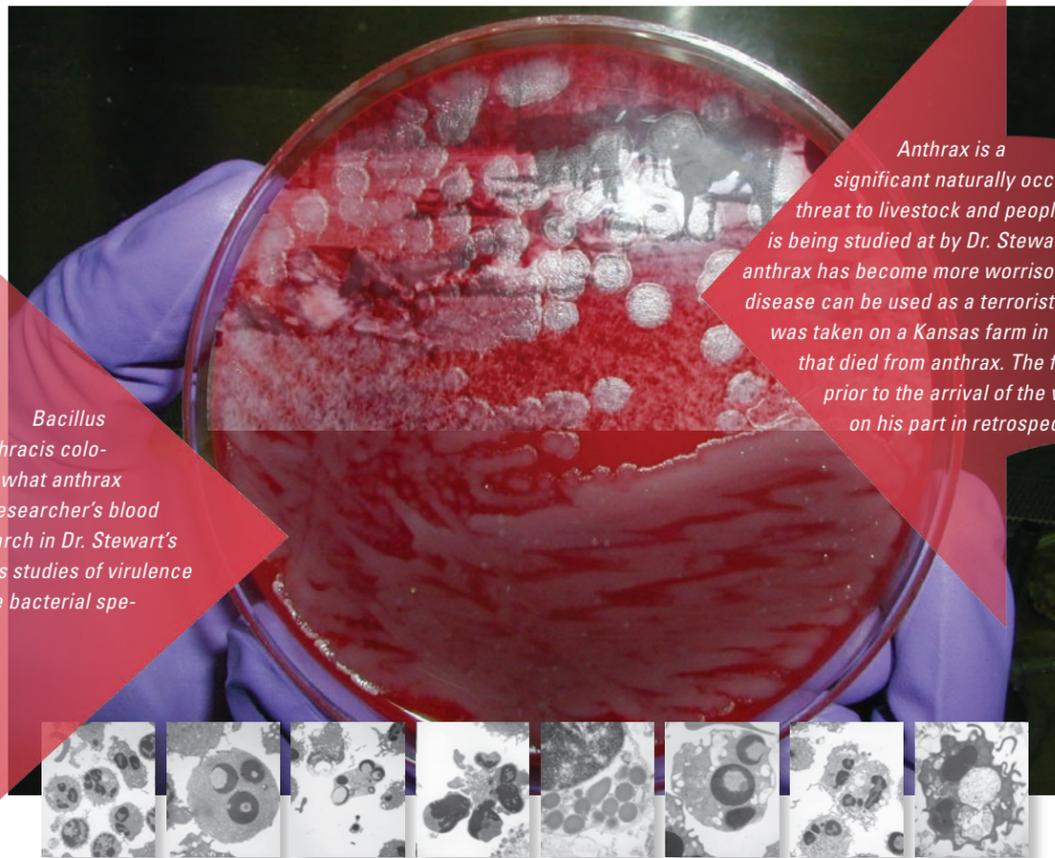


Dr. George Stewart.

A Dream of Eradicating Disease

An MU Endowed Professor Looks At How Pathogens Cause Sickness

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Bacillus anthracis colonies—this is what anthrax looks like in a researcher's blood agar plate. Research in Dr. Stewart's laboratory involves studies of virulence properties of these bacterial species.

Anthrax is a significant naturally occurring threat to livestock and people and one that is being studied at by Dr. Stewart. The threat from anthrax has become more worrisome recently as this disease can be used as a terrorist weapon. This photo was taken on a Kansas farm in 1919 and shows cattle that died from anthrax. The farmer had skinned the cattle prior to the arrival of the veterinarian, not a wise move on his part in retrospect, says Dr. Stewart.

Charles and Charlene McKee's dream is beginning to take tangible form.

Last year, Dr. George Stewart joined the faculty of the University of Missouri College of Veterinary Medicine as the Charles & Charlene McKee Professor in Microbial Pathogenesis.

Microbial pathogenesis, in laymen's terms, is the study of how infectious diseases occur and spread. In keeping with the wishes of the McKees, the research conducted under the professorship must be relevant to food-producing animals, such as cattle and hogs. However, the research may have application to other species, including humans, and potentially be funded by both the US Department of Agriculture and the National Institutes of Health.

Such research has important implications. With every passing day, the news media reports on either an outbreak of a new disease, the spread of a disease thought to be under control, or the emergence of an antibiotic-resistant strain of an organism and the impact on human and animal life. Scientists are still trying to understand how microorganisms cause disease and are working to develop new strategies to deal with them. It has become apparent that microorganisms and the host have a dynamic and active interaction. It is essential that scientists understand the basic principles of molecular and cell biology in order to decipher the pathogenic mechanisms.

The endowment to study pathogenesis was made by the late Charles McKee, a graduate of the MU School of Journalism. He had a distinguished military career before retiring to southern Arizona.

Col. McKee had a special love for animals, particularly horses and other livestock, thus explaining his decision to leave his estate to the College of Veterinary Medicine.

The new professorship will build on an already impressive cooperative effort between the Veterinary Pathobiology Department and the Molecular Microbiology and Immunology Department at the MU School of Medicine. The new professorship is one of seven special programs at the college endowed through gifts of at least \$550,000 since 1993.

Research into microbial pathogenesis can touch a broad range of scientific disciplines including cancer biology, microbiology, immunology, virology, cell biology, genetics, tissue biology, and neuroscience. Microbial pathogens can be bacteria, viruses, fungi, and parasites that together account for a large percentage of acute and chronic human diseases. Answering fundamental questions regarding host-microbe interactions requires an interdisciplinary approach, including microbiology, genomics, informatics, molecular biology, biochemistry, immunology, epidemiology and cell biology.

MU is uniquely situated for collaborative study. It houses a college of veterinary medicine, school of medicine, school of nursing, college of agriculture, center for life sciences, and a nuclear research reactor on one campus. "Pathogenesis, by its very nature, represents the interface between



The disease *fusobacterium necrophorum* can cause liver abscesses, like these.

multiple classical disciplines, including pathology, microbiology, immunology, and genetics," says Dr. Jerry Buening, retired chair of Veterinary Pathobiology. "Another unique theme of microbial pathogenesis is the conviction that there are many common features in infections produced by different kinds of agents."

Dr. Stewart earned his undergraduate degree from North Texas State University. His PhD in 1980 came from the University of Texas Health Science Center-Dallas. Before joining MU, he was a professor of microbiology at Kansas State University.

His KSU research concentrated around a molecular genetic approach to define the components of bacterial cell division. His work in the laboratory identified two genetic triggers involved in determining the site at which the cell division occurs. Such knowledge is important in the development of broad spectrum antibacterial chemotherapeutic agents.

Another area of research involves the process about how certain human and animal pathogens control the production of toxic proteins.

"The boundaries between veterinary medicine and human medicine are becoming blurred," Dr. Stewart said. "Many of the important infectious disease agents today impact both animal and human health. We work to understand bacterial virulence properties to allow the development of better treatment options for patients, be they two-legged or four-legged." **Ark**

For more information about the MU College of Veterinary Medicine, see its web page at: www.cvm.missouri.edu/vpbio/index.html
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Clover's Comeback ■ Continued from page 1



The University of Missouri Veterinary Medical Teaching Hospital is the state's largest referral hospital. Surgeons there often get the most demanding of cases.

Holding Clover's tibia together was one of the greatest challenges for the MU orthopedic team. They used internal and external braces to hold the shattered bone together so that it would heal.

Violence Against Animals and People

It's difficult to ascertain the extent of animal cruelty in the US. Cruelty to animals is not monitored systematically in national crime reporting systems, so there is little hard national evidence as to how prevalent the problem is. There are inconsistent local and state standards on what constitutes cruelty, also. Legal definitions range from a toddler pulling a cat's tail to men trapping dogs to set them on fire with gasoline.

All 50 states have legislation relating to animal abuse. Most states categorize it as a misdemeanor offense, and 30 states also have instituted felony-level statutes for certain forms of cruelty to animals.

There is a high correlation between family violence and animal cruelty. A 1983 study of New Jersey families referred to youth and family services for reasons of child abuse reported that 88 percent of cases had at least one member of the household who physically abused animals. More recently, an English researcher found that 83 percent of families reported for animal abuse also had children listed at high risk of abuse or neglect.

National domestic abuse studies have shown that up to 40 percent of women trying to leave an abusive relationship delay going to a shelter because they fear what will happen to their pet left behind.

Since 2000, the Humane Society of the United States has conducted a yearly non-scientific study of animal cruelty cases.

The 2003 statistics, based on 1,373 animal cruelty cases, provide a snapshot of animal cruelty and neglect. Of the report's cases, 784 (57 percent) involved intentional cruelty toward animals and 589 (43 percent) involved animal neglect. The report included cases of animal fighting (dog fighting and cock-fighting), and animal hoarding.

The data indicate that adult and teenage males seem to commit a high percentage of intentional animal cruelty. Males have a higher percentage of involvement in animal neglect than females, but females have a higher percentage of involvement in animal hoarding cases.

Companion animals are the most common victims of abuse, though cruelty to cats is not reported as frequently as cruelty to dogs. Shooting is the most common form of intentional cru-

elty, and hanging is the most common offense committed by females.

Sociologists have long noted that violent criminals first experimented with violence by injuring or killing animals. Violent tendencies of the 20th century's most infamous criminals were first demonstrated in crimes against animals: mass-murderer and cannibal Jeffrey Dahmer killed neighbors' pets and impaled a dog's head on a stick; David Berkowitz, the Son of Sam, shot his neighbor's labrador retriever; and Albert DeSalvo, the Boston Strangler, shot arrows into boxes of trapped cats and dogs.

Department of Justice studies of prison inmates reveal that as many as 75 percent of violent offenders had early records of animal cruelty.

It is difficult to accurately count how many of the 17,000 cases that come into the MU Veterinary Medical Teaching Hospital are caused by intentional abuse. Many cases are obvious, and MU faculty appear in criminal court to help prosecute offenders. Other cases, like poisonings, are more difficult to exactly identify.

Clover Comes to MU

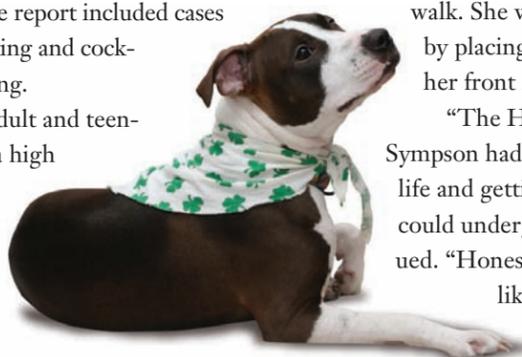
Like the Kansas greyhound, Clover's medical case was challenging.

Bradley Dible, MU College of Veterinary Medicine Class of 2007, was there when Clover was brought into the hospital and assisted the orthopedic team's work.

"When Clover presented to us she was in bad shape," he said. "She was still thin and weak from being without food for so long and was not able to walk. She was able to stand with assistance by placing essentially all of her weight on her front limbs.

"The Humane Society team and Dr. Sympton had done a great job in saving her life and getting her to a point where she could undergo surgery," Mr. Dible continued. "Honestly, I had never seen anything like this case before—the X-rays

Dr. Sympton took and those that we took here showed that she had at least nine separate fractures. The fractures of the jaw, ribs, and front limb were healing well now that Clover was being taken care of, but the fractures of both hips and the tibia bone in the hindlimbs were remarkably severe, and obviously painful. These needed to be addressed surgically. We had



Clover today shows few external signs of her abuse. Today she lives in St. Charles, not far from the St. Charles Humane Society that rescued her. The organization provides care and homes for almost 1,000 cats and dogs yearly. All of the animals at the shelter are wormed, vaccinated, spayed/neutered, and micro-chipped before being placed up for adoption. The SCHS is a not-for-profit organization and receives no tax dollars. It relies on volunteers, foster homes, and donors to make monetary or in-kind donations and services.

to come up with a plan to get Clover out of pain and back on all four legs to save her ability to function and survive."

The broken leg bones were so badly injured that conventional techniques would not help. Adding to this challenge was that all of the orthopedic injuries had to be addressed at the same time to allow for simultaneous healing and to spare Clover multiple operations.

So, the MU orthopedic team innovated, mixing and matching techniques used for other injuries with new concepts. They placed pins in the broken tibia that were held in place with a temporary external fixator—a mechanical device outside of the skin designed to keep the broken bones in place until they can heal. They used this device to align, compress, and stabilize the tibia fracture.

The next problem was the two hip fractures. The damage was so severe and long-standing at this point that conventional fracture repair or even total hip replacements were not possible. The team did the next best thing—they removed the damaged bone from the fractures and reshaped the femur while repositioning muscles on each side. This allowed a fibrous tissue hip joint, essentially a pain-free and functional pseudo-joint, to form.

Despite its complexity, the surgery went well with no complications. Seven days later, Clover walked out of the teaching hospital, the external fixator assembly serving as a weight-bearing skeleton until her bones healed. "After the procedure she was able to stand and walk without pain," Mr. Dible said. "She was still weak from all she had been through, but you could tell how much better she felt already and that she would make it. Dogs are amazing."

Clover spent another week at the MU teaching hospital under observation. Her bright and sunny disposition, surprising given her history, made her a star there. MU Orthopedics Veterinary Technician Jodi Beetem, who also assisted with Clover's surgery, remembers her as a sweetheart who happily greeted everyone she met.

Eight weeks after the surgery, she came back to have some of orthopedic mechanical parts removed and check for progress.

"She was doing great," Ms. Beetem said. "She had put on some weight and was really using her legs well and seemed to be a normal, healthy, happy puppy ready to run and play."

Clover Performs a Vital Mission



Clover was released from the care of the MU teaching hospital with nothing more than instructions for annual return checkups. This meant she was ready for a new foster family, and there were a number of candidates waiting to take her home.

Before that, however, she had a mission to perform. The St. Charles Humane Society's had started a fundraising campaign against animal abuse. Clover's story was a natural center point. It highlighted how people who love animals can overcome the actions of those who don't.

Clover set out on a St. Louis media campaign that burgeoning rock stars would envy. Newspaper, TV, and magazines featured her story. She appeared in local advertising and web pages. She made public appearances, eagerly accepting the hugs that strangers would give her.

Hugs and attention that she returned with a wagging tail and wet doggie kisses. **Ark**

For more information about the MU College of Veterinary Medicine, see its web page at: www.cvm.missouri.edu
For information about helping to support the College's clinical efforts, contact Greg Jones, director of development, at 1-888-850-2357.



REMEMBERING A PRECIOUS PET THROUGH THE PET MEMORIAL PROGRAM

Eight years after the death of his dog Choo-Choo, Howard Adkins still treasures the memory of the beloved Lhasa Apso. Choo-Choo's full name, he explains, was Chattanooga Choo-Choo, a reference to her puppyhood habit of puffing like a locomotive as she dashed through the Adkins home. The name Choo-Choo also proved descriptive in another way. The little dog notoriously gnawed a few items of furniture to pieces, but a mangled bit of wood was a small price to pay for Choo-Choo's companionship.

"She was a wonderful dog," Mr. Adkins says, simply.

When Choo-Choo died in 1996, her

veterinarian, Beverly Scott, MU DVM '78, of Gilbert, Ariz., made a gift to the University of Missouri-Columbia College of Veterinary Medicine in Choo-Choo's memory as part of the college's Pet Memorial Program.

"It still touches me," Mr. Adkins says. "She did something that touched my life and in an extremely emotional, stressful time."

Mr. Adkins is not Dr. Scott's only client to have been touched by a memorial gift. She has participated in the Pet Memorial Program for more than 15 years. "It's a good way to try to recognize special owners' special pets and the bonds they have had," she says. "It's also a good way to support

my College of Veterinary Medicine."

When the college receives a gift through the Pet Memorial Program, a personalized card is sent to the pet's owner expressing the veterinarian's condolences and explaining how the gift will benefit animal health.

Mr. Adkins was so touched by Dr. Scott's thoughtfulness that, though he is not an MU alumnus, he, too, now gives to the college, on the anniversaries of Choo-Choo's birth and death.

"I contribute," he says, "not just to keep the memory of Choo-Choo alive — she'll never die in my mind — but also to honor Dr. Scott."



The Pet Memorial Program is an awesome program. I'm not sure that veterinarians are aware of it, how easy it is to do, and how much of an impact a small donation can have on clients, veterinarians, and the College of Veterinary Medicine.

— Denise Roche, MU DVM '91



Our family was overwhelmed when we learned of the Memorial Gift in honor of our dog, Tiffany. Over the many years that our pets have been patients, our veterinarians have demonstrated the highest degree of care and compassion. Thank you.

— Veterinary Client



I had many clients show the sympathy letters to their friends, whose reaction was most often, "That's really nice; my vet never does that." I even sent a Pet Memorial donation for people that only came to my clinic to have their family member euthanized. A good percentage of those people later brought their new pets to my clinic.

— Bert Childers, MU DVM '67

It's easy for veterinarians to participate in MU's Pet Memorial Program. Contact the College's Development Office at 1-888-850-2357 for the Participation Forms. You can download forms at: www.cvm.missouri.edu/giving/PetMemorialForm.pdf

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