

Veterinary and Science Partnerships



Broadening Science Promotion in Rural Middle Schools through the Veterinarians' Black Bag



Veterinarian Classroom Visits; Lesson Plans; Biomedical Careers



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Partnership for Environmental Education and Rural Health

College of Veterinary Medicine and Biomedical Sciences,  TEXAS A&M UNIVERSITY

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Letter from Principal Investigator

The goal of this monograph is to describe a unique and innovative model for enriching health science education in secondary schools through veterinary and science partnerships. We call the program “Veterinarians’ Black Bag.” The idea is for veterinarians to visit a school to introduce a topic using instructional material we have produced, and for the teacher to present related, hands-on follow-up lessons after the veterinarian’s visit. Through this unique, engaging model, a larger number of students throughout Texas, and ultimately the nation, will be encouraged to enter and remain in science academic tracks to meet the needs of the nation’s future scientific, biomedical, medical, veterinary medical, and technological workforce.



For eight years, the Partnership for Environmental Education and Rural Health (PEER) has been focused on producing middle school curriculum, training teachers, and providing scientist visits to rural schools. During this time, PEER has trained 900 teachers and produced 170 days of curricula, most of which integrate environmental health science into science, mathematics, social studies, and English Language Arts. To publicize opportunities for these activities, PEER has mailed more than 3,000 invitations per year to teachers or rural school districts to obtain and use PEER curricula, to attend PEER teacher workshops, or to have a scientist visit their school. The number of requests for scientist visits always exceeds the capability of PEER scientists and PEER resources. Hence, there are both requests and needs for more science role models to promote science in rural schools.

PEER desires to solicit help from a large number of local science role models because they do not have to travel great distances and do not require monetary compensation for their services. The obvious choice is the local veterinarian. Local veterinarians already live in rural areas where science role models are most needed. By interacting with public schools, veterinarians build relationships in their communities, have the opportunity to give back to their communities, and meet potential clients as they promote science.

Veterinarians have long been involved in their communities. Veterinarians have the same basic course training as medical doctors and are capable of science promotion and serving as scientific role models. Many veterinarians currently attend career days in public schools, and others provide instruction to K-12 students on their visits to schools and in their clinics. Despite these contributions, there are still needs in rural public schools. PEER’s goal is to provide teaching aids, a script, and streaming video presentations to assist local veterinarians in preparing for visits to public schools. In addition to helping veterinarians prepare for presentations, PEER, through the Veterinarians’ Black Bag Program, provides supportive follow-up lessons for teachers to give to students following veterinarian visits.

An advantage of veterinary and science partnerships in promotion of science is that these partnerships are readily extendable nationwide via the national networks of veterinary schools and practicing veterinarians to meet the needs of rural schools nationwide.

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Table of Contents

	Page		Page
Part I: Texas A&M University			
Veterinarian Outreach Activities			
Veterinary School Open House	4	It's Science, and it's a Career	27
Extension Veterinary Medicine	5	Lessons Learned: Vets' Visits	28
Aggie Day	8	Science Role Models in Public Schools	29
Duke TIP Summer Studies	9		
	11	Part IV: Veterinarians' Black Bag	32
Part II: Veterinary School Professionals			
Leaders are Made, Not Born	13	Students Use Black Bag In The Classroom	33
Finding Science with a "Big Mac Attack"	14	The Veterinarians' Black Bag Lessons	34
'What's That?' in Career Selection	15	More Resources for Teachers	35
Professional Profiles	16	A Message for Veterinarians	36
Veterinary Professor Profiles	18	Black Bag Follow-up Activities - Examples:	
	19	• Infectious Diseases	39
		• Animal Traits and Behavior	42
		• Clinical Trials	46
		• Physical Exam	49
		• Animal Research	51
Part III: Veterinarians and Scientists in Secondary Schools			
All in a Day's Work	24	The National Center for Research Resources	53
	25	Current and Coming Attractions!	54

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As role models, veterinarians and veterinary students are important public figures in rural communities. Veterinary outreach efforts stimulate curiosity and motivation among youth and adults in the community, and they equip veterinary students with the valuable communication skills they will indeed put to good use when interacting with the public as veterinarians. By sharing their time, energy, and knowledge with the community, veterinary students are better able to prepare themselves for their future public service roles.



Veterinary School Outreach

Any veterinary school is a great supplier of resources, knowledge, and fun in the community. With stockpiles of equipment, specimens, and educated students and faculty, veterinary schools serve as the perfect venue for community-wide education. Schools willing to open their doors for such efforts surely discover the benefits of having active outreach programs. Here are just a few examples of outreach at the Texas A&M University College of Veterinary Medicine and Biomedical Sciences.



Each year in the spring, the veterinary school at Texas A&M University extends its resources to the public during its Open House. For one day, up to ten thousand people visit the veterinary school to participate in various activities. Members of the community can explore exciting and educational exhibits in the veterinary school, the small animal clinic, and the large animal clinic. The goal of the veterinary school's Open House is to bring everyone who participates closer to the world of veterinary medicine and biomedical science by informing the public about the roles veterinarians play in our society and perhaps even inspiring youngsters to pursue a career in science.

One main attraction is Teddy Bear Surgery. During this popular event, Texas youth dress up like surgeons and sew up a 'cut' in a teddy bear. Other attractions include an anatomy laboratory, real-life exhibits, and live animal exhibitions.

In the anatomy laboratory, students learn about bones of skeletons from various species, and they get the chance to discover for themselves how structures look under a microscope.



Young Texans share in the discovery of the world of microscopic anatomy and the instruments used to observe it.



Two brothers marvel at images of microscopic anatomy.

Live animal interface is always a treat for youth. At the Open House, kids can learn where milk is produced and how to collect it. Other brave youth and parents learn what is inside the first stomach (rumen) of a cow by reaching inside and retrieving contents for inspection. Youngsters share their discoveries as they enjoy the opportunity to examine life forms and tissue parts.

Open house is a perfect opportunity to arouse some enthusiasm and interest in veterinary medical professions, and it also serves to educate the public about animals and animal safety.

Who better to teach the public about what veterinarians do than those learning to become veterinarians themselves? An underlying theme is that Open House is organized and

Veterinary School Open House... continued

run by veterinary students. They are the instructors for the day as they share their knowledge with Texas youth and hone their public communication skill, which is a valuable career skill they will take with them into the job market.

One might ask why it is so important to these veterinary students that they share knowledge about veterinary medicine with the community. Meredith Clancy, a former vet student at Texas A&M, understands the importance of sharing her knowledge and time with the public. "Veterinarians comprise a very select group of incredible people. Veterinarians protect the food supply that we each eat every day, they help develop new pharmaceuticals, and they protect the myriad of other species on this planet. It's hard to find another field so varied and so exciting."

As executive director for the 2008 event, Clancy had big plans for the Vet School Open House. "One of the most important things the Texas A&M University College of Veterinary Medicine can do is show the community what we do," Clancy says. "I took the experiences I've had and made this incredible event even more successful to reach even more families and students."

Clancy also points out that Open House is a perfect opportunity for aspiring vet students, perhaps those already enrolled in a university as undergraduates, to take a look at Texas A&M's Veterinary School and hospitals before applying. "Open House is an ideal opportunity for anyone wanting to get involved in veterinary medicine," says Clancy, "We have veterinary medicine organizations from across the state and information on all sorts of veterinary



Students enjoying successful teddy bear surgery as they learn about surgical procedures used with animals and humans.

education available in one place on one day."

Further, the vet students who organize Open House get the opportunity to demonstrate to an interested audience exactly what kind of work they do at the veterinary school and how hard they have worked to get to where they are now. This is informational and interesting for community members, particularly youth, who are interested in pursuing veterinary medicine as a career. This is also a reward-



A veterinary student looks on as the young at heart are impressed by veterinary anatomical specimens.



A child discovers the source of milk as a veterinary student demonstrates the milking process.

“One of the most important things the Texas A&M University College of Veterinary Medicine can do is show the community what we do and what is available to them through the Veterinary School.”

ing opportunity for vet students who are eager to share their successes with the community.

Besides inspiring community members to consider veterinary medicine as a career, Open House also serves to enlighten interested participants about the many facets of veterinary medicine. For example, the Vet School's Open House is a way to show the community the benefits



A youngster enjoys successful milking a cow as veterinary student, Boy Scout, and others observe.



An eager student discovers what is inside the stomach of a live cow.

of animal research for the health of humans and animals. Animal research has played an important role in almost every major medical advance of the last century, from antibiotics to antidepressants to joint replacement surgery. Veterinary students and faculty take Open House as an opportunity to highlight how animal systems provide valuable insight into human systems by teaching the community the genetic and physiological similarities between animals and ourselves.

The ultimate advantage of holding the Open House at the Texas A&M Veterinary School is that the staff is able to highlight new advances in veterinary medical fields, such as pathology or oncology that many younger students may not realize exist in this expanding profession. Also, participants are able to learn about the various types of ongoing research and the new diagnostic tools and treatments available at the school's various clinics.

Extension Veterinary Medicine: Large Animal Clinical Sciences

The College of Veterinary Medicine has an Extension Service that is very active in reaching youth across the State of Texas through career development programs.

The 4-H Veterinary Science Program utilizes the “Veterinary Assistant Handbook” and supplements authored by the College faculty. The program is a 5-year curriculum of 100 lessons and 50 activities to give youth interested in veterinary medicine opportunities to work in the field. Teachers are private veterinarians, veterinary technicians, and veterinary assistants. The program is career oriented with textbook instruction and job training in private veterinary practices to prepare students for the field of veterinary medicine they choose to pursue. Once the students have completed the program, they receive the title of “Veterinary Assistant” and are qualified for certification by the State Certified Veterinary Assistant Examination. Annual enrollment of primary and secondary students is more than 1000 in County 4-H Veterinary Science Projects.

The High School Veterinary Assistant Course Program utilizes the “Veterinary Assistant Handbook” and supplements authored by College faculty. The course offerings are Introduction to Veterinary Technology (1 semester), Veterinary Assistant I (2 semesters) and Veterinary Assistant II (2 semesters). Annual enrollment of secondary students is more than 1000 in High School Agricultural Science and Agricultural Cooperative Classes.

The Veterinary Student Recruitment Program reaches more than 50,000 primary and secondary students annually through public school career fairs, County Extension career fairs, and major livestock show exhibits. The students receive counseling on site and in follow-up sessions for guidance in developing career plans for a field in the veterinary medical profession.

The Texas State 4-H Roundup Veterinary Program includes educational seminars in the College



4-H students and their parents learn about horse bits and shoeing horses during a visit to the Veterinary School.

for youth during the annual Texas State 4-H Roundup Contest in the summer. The 4-Hers meet with faculty and veterinary students to participate in lectures, demonstrations, and hands-on activities. These partnerships encourage youth to pursue various careers in veterinary medicine.

For more information: <http://extensionvetmed.tamu.edu>.



Dr. Buddy Faries, an extension veterinarian, demonstrates common veterinary procedures to enthusiastic students.

Every other January, the Rio Grande Region of the United States Pony Club canters into the Texas A&M Veterinary School to participate in Aggie Day and to hone their knowledge of equine veterinary skills and to meet the knowledge standards required by the United States Pony Club (USPC). Pony Club is one of the leading junior equestrian organizations in the world.

At Aggie Day, there are lectures on nutrition, management, care of horses, and how to prepare for entry into college and veterinary school. In addition, there are 18 to 20 individual stations geared to meet the USPC knowledge standards for various rating levels of pony clubbers. Each station is designed to allow the students to master each content level and to inspire students to reach levels above their current rating.

At one station, a veterinary student compares the horse and human skeletons to indicate the locations and functions of similar bones. The veterinary student also explains the evolutionary changes that allow the horse to stand on a single-toed foot.

Using skills on hand, a veterinary student illustrates how shapes of skulls, teeth present, and tooth wear can be used to indicate the age of horses. Floating a horse's teeth (smoothing the horse's teeth with a file called a float) is an important skill taught at Aggie Day. At one station, students compare an unfloat set of teeth to a freshly floated set and several veterinary dental techniques are illustrated.

Another station displays partial dissections of feet and legs that allow youngsters to reconstruct the foot while observing internal anatomical structures. Also at this station, a veterinary student illustrates how horses' joints move. In addition to providing the veterinary students an opportunity to teach, veterinary students are given the chance to mentor pony clubbers by helping them with illustrations of



A veterinary student illustrates the benefit of floating horses' teeth and the effect of age on tooth replacement and wear.

color, breed markings, and the origin of different breeds of horses.

Pony clubbers have heard of fecal parasite counts for their horses, but at Aggie Day, they are allowed to perform a fecal egg flotation count to estimate the number of internal parasites a horse is carrying. This gives students an

“Aggie Day stimulates interest in science, medicine, and pursuing careers in these fields.”



A veterinary student compares the skeleton of a horse with that of a human.



A student explains the Health Care and Veterinary Knowledge standards required of young pony clubbers.

Aggie Day... continued

opportunity to envision parasite transmission and load in animals and humans of third world countries.

Youth should never be allowed to nail a shoe on their own horse without proper training. At Aggie Day they are allowed to experience horse shoeing, an activity they have watched numerous times, without the danger of hurting their horse or themselves. As they participate in the shoeing, a veterinary student and farrier watches and explains the importance of proper shoeing in horses and proper procedures in administering medical treatments.

On a tour of the veterinary school, pony clubbers learn about radiology and the intensive care of horses. Pony clubbers are also taught the logistic procedures used by veterinary hospitals from the time the animal enters the large animal hospital, through different diagnostics and treatments, to the time the horse is released. Students also have a chance to listen to horses breathe and their heart beats.

The veterinary students who run Aggie Day realize the benefits of community outreach. Charles Collins, a former veterinary student working the equine leg anatomy station, says, "Aggie Day stimulates interest in children about wanting to pursue a career in veterinary medicine." It is an opportunity for kids to see and experience some of the things they hear about in 4-H and Pony Club. "Everyone wanted to see the navicular bone. That was a real interest for a lot of the kids," Collins recalls.

It is also important to note that with veterinary outreach efforts like Aggie Day, benefits run in a two-way



Students learn the characteristics of horseshoe nails and the proper technique for driving them into the hoof to secure the shoe.

street. Not only do the attending kids and parents learn a great deal, the veterinary students involved gain great career skills they will never learn in a lecture or a laboratory. "We've spent years in classrooms discussing veterinary topics and techniques with each other, but it helps to learn how to talk to people who don't have our same background," Collins says. He says that outreach events like Aggie Day "help vet students learn how to explain things to kids and their parents," and more importantly, "It helps prepare us to answer their questions."



Pony clubbers are allowed to interact with live horses and enjoy learning how to take the vital signs of horses.



Many of the Aggie Day stations are equipped with live animals. Here, pony clubbers and their parents learn about body weight estimation and body condition scoring.

During two 3-week summer sessions, approximately 50 seventh-through-tenth grade students inundated the hallways, classrooms, labs, and clinics of the Texas A&M veterinary school. No, these were not your everyday, run-of-the-mill summer campers awaiting itineraries of arts and crafts or swimming as an escape from the school year; these “campers” were participants in the Duke Talent Identification Program (Duke TIP). Students arrived at Texas A&M from all over the nation to spend part of their summer break studying veterinary medicine and realizing the scope of career opportunities available to those who pursue veterinary medicine as a field of study.

Duke TIP Summer Studies Programs offer students in grades 7 through 10 the opportunity to learn very challenging material at a rate consistent with their advanced capabilities. Students enroll in a single Duke TIP-designed course for three weeks of in-depth study; they attend nearly 40 hours of class each week between Monday morning and Saturday afternoon. The courses are taught by a team of highly qualified instructors and teaching assistants.

Duke TIP Summer Programs are offered at college campuses across the nation, each offering a specific collection of courses. The university setting provides participants with an opportunity to encounter college classroom instruction while interacting together in residence

hall living. Available courses range from marine biology to political theory.

At Texas A&M University, the Duke TIP Summer Program offers a course titled Introduction to Veterinary Medicine. Summer 2007 was the first year that veterinary medicine was offered as a Duke TIP course at Texas A&M. Larry Johnson, Ph.D., and Shawn Martin taught the course with the help of three veterinary students who served as teaching assistants. Dr. Johnson is a professor of histology, the outreach coordinator for the College of Veterinary Medicine, and the chief investigator of the Partnership for Environmental Education and Rural Health (PEER). Shawn Martin is a middle school teacher and a collaborator of PEER.

In the Introduction to Veterinary Medicine course, students are familiarized with the veterinary sciences and the veterinary profession. The course is designed primarily to introduce students to a variety of veterinary medical tools and to expose them to the multiple career opportunities associated with veterinary medicine. Another important aspect of this course involves presenting students with problems related to research and clinical treatment of animals so that they may implement novel strategies to find solutions.



Dr. Louise Abbott engaged Duke TIP students in a hands-on laboratory experiment involving the scientific method to study animal behavior.



Duke TIP Summer Studies Programs provide students an opportunity to learn challenging material in an interactive environment.

Duke TIP Summer Studies...continued

A typical day for a Duke TIP participant includes a lecture and discussion led by one of Texas A&M University's College of Veterinary Medicine faculty members, a visit to one of the veterinary school's laboratories or clinics, hands-on activities, group projects, and evening study sessions.

Because of the expansive curriculum veterinary medical training includes, Duke TIP participants are exposed to a wide range of fields including comparative anatomy



Duke TIP Participants learn anatomy hands-on with parts of a plastinated dog.

and physiology, histology, biochemistry, pharmacology, toxicology, animal health, public health, communication, and veterinary medical ethics. With such a rigorous schedule, it is important that faculty members in the areas listed



Duke TIP students learned many laboratory techniques including how to analyze DNA by gel electrophoresis.

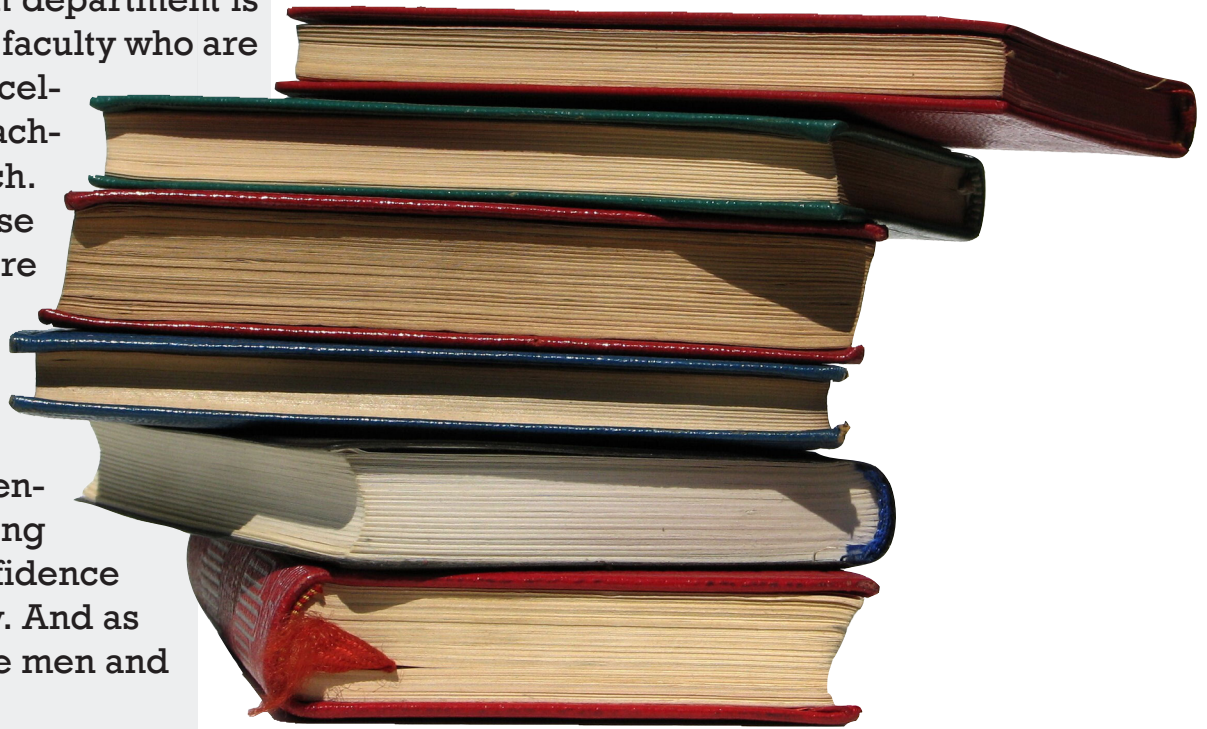
above are willing to participate and share their knowledge with the Duke TIP participants. At Texas A&M, more than 20 faculty members, in fields from basic science to clinical applications, are willing to participate. This illustrates that faculty members realize the importance of stimulating interest in veterinary medicine and want to contribute to the education of youth in this field.

By hosting a Duke TIP Summer Studies Program, the Texas A&M Veterinary School and the College of Veterinary Medicine are providing a unique learning environment designed to motivate and challenge academically gifted students. More importantly, the program helps prepare ambitious students to enter the biomedical, veterinary medical, and technological workforce with confidence.



Duke Tip students completed a final assignment in which they analyzed a current problem in veterinary medicine and presented their findings to their peers. This assignment required the students to take a veterinarian's approach to understanding and solving a real-world problem.

The College of Veterinary Medicine at Texas A&M University includes five departments: Veterinary Integrative Biosciences, Veterinary Pathobiology, Veterinary Physiology and Pharmacology, Large Animal Clinical Sciences, and Small Animal Clinical Sciences. Each department is home to a diverse faculty who are committed to excellence in both teaching and research. As teachers, these professors prepare willing and enthusiastic veterinary, graduate, and undergraduate students to enter their challenging careers with confidence and responsibility. And as researchers, these men and



Veterinary School Professionals

women shape the future of veterinary medicine and related fields with novel discoveries in physiology, immunology, microbiology, pharmacology, and the list goes on.

Here is a look at some faculty members who are actively involved not only in teaching and research at the university, but also in outreach and service efforts around the community. Each has unique interests and experiences to share and they serve as role models for both students and community members.



Dr. Anton Hoffman, 2007 TAMU Former Student Distinguished Achievement Awardee in teaching, presents a gross anatomy lecture.

As many veterinary students have discovered through public outreach, no longer is providing quality veterinary medical care the only skill a veterinarian needs to be successful. A foundation in ethical decision making, the ability to see the “big picture,” and the leadership and communication skills to use that vision to motivate teams of people are the hallmarks of the future of veterinary medical practice and success.

At its 15th Annual Educational Symposium, the Association of American Veterinary Medical Colleges (AAVMC) determined the top 12 skill sets desired by veterinary employers. To ensure attainment of these skills in their students, the Texas A&M College of Veterinary Medicine & Biomedical Sciences has designed the Center for Executive Leadership in Veterinary Medicine. Initiated in 2001, the Center was created to help develop, train, and graduate veterinary medical leaders of the future.

Through a combination of coursework, special seminars, experiential opportunities, dual degree programs, career guidance, and counseling from executive leaders in the veterinary medical profession, this program aims to transform CVM graduates into balanced decision makers, skillful practitioners, and most importantly, effective communicators.

“Leadership is not an easy subject you can just teach out of a book,” says Dr. E. Dean Gage, Executive Director of the Center for Executive Leadership in Veterinary Medicine, “yet it’s vitally important to share it with our students. Putting this newly acquired knowledge into practice through multiple experiential opportunities is even more important to the leadership development and success of our students.” Outreach programs facilitated

by the CVM are a venue in which students can put their communication skills into practice as they interact with the public to teach, explain, and answer questions.

Veterinary medicine is indeed a field wrought by constant change as it adapts to the needs of a transforming society and the capabilities of emerging technology. Therefore, it is important that students entering the field of veterinary medicine realize their expanding role in society. To better prepare these students, the Center for Executive Leadership establishes partnerships between stu-

“Leadership is not an easy subject you can just teach out of a book, yet it’s vitally important to share it with our students.”

dents and corporate, practice, and professional leaders. Leadership concepts are integrated into all four years of the curriculum wherever possible, but there has also been a surge in leadership opportunities, particularly with the newly created DVM/MBA program. “The DVM/MBA program began six years ago. It is a partnership between the CVM and the Mays School of Business at Texas A&M,” explained Gage. “Current DVM students take a brief hiatus from the veterinary coursework between the second and third years to complete requirements for the MBA in only one year. They then return to the CVM to finish out the professional program. A second alternative schedule is to begin the MBA immediately after completing the DVM degree. While the students are in the MBA program, they are required to complete a business consulting project designed to address issues impacting the business of the veterinary medical profession.

“The bottom line is that as the profession changes, we must educate, train and provide graduates that are better prepared to meet the challenges of that changing future,” stated Gage. “Employers want our graduates, and we want them to be successful. This is absolutely a win-win for everyone – for the employers, the students and the CVM. Our goal is to graduate the ‘leaders of tomorrow.’”

Top 12 Skills Desired by Veterinary Employers

1. Communication Skills
2. Team Building and Teamwork Skills
3. Problem Solving
4. Information Management
5. Leadership Skills
6. Emotional Stability
7. Intellectual and Cultural Sensitivity
8. Willingness to Work Hard
9. Life-Long Commitment to Learn
10. Business and Management Skills
11. Technical Veterinary Skills with Additional Species Skills
12. Income Generation Capability

Source: AAVMC 15th Annual Educational Symposium

No, I don't mean a giant cheeseburger. This “Big Mac” was David McPherson, the high school vocational agriculture teacher 50 years ago at my small rural school outside of Memphis, Tennessee. “Mr. Mac,” as we called him, was about six foot five, skinny with bones sticking out everywhere, and had a big Adam's apple in his throat. He looked like I imagined Abraham Lincoln must have looked. Mr. Mac was also physically tough. He refereed both football and basketball games and could run up and down the field or court as well as the players.

Mr. Mac required everybody in his Vo-Ag classes to have a project. We were, after all, supposed to be “Future Farmers of America” (FFA), as our club was named. Most of us had animal projects. I had pigs (my favorite Duroc sow once surprised everybody with a healthy litter of 16). I also raised Jersey milk cows. Hand milking four cows before catching the school bus every morning was a real drag, but to this day I still have big forearms from all that milking exercise (want to arm wrestle?).

Mr. Mac was also big on competition and leadership training. We had classes on parliamentary procedure, and our teams competed against parliamentary procedure teams at other schools all over West Tennessee. We were never good enough to advance to the next level of contests elsewhere in the state or Mid-South, but some of the leadership training rubbed off. I was elected twice as student body president, and I remember being president of at least four school clubs. Mr. Mac also taught us how to judge livestock, and he used his own out-of-class time to take us to numerous judging contests. I don't remember winning anything, but we got to travel a lot.

Clearly, Mr. Mac cared a lot about his students. But we never thought of him as a “soft touch.” He learned how to deal with the student toughs and trouble makers; the school counselors steered such students into his classes because he was the only teacher who could manage them. One of the many legends about Mr. Mac was an incident that supposedly happened several years before I was his student. A particularly obnoxious

student, a big, tough football player in the back of the room, was mouthing off and disrupting class. After several warnings, Mr. Mac exploded, ostensibly gliding over the tops of three rows of tables, as if walking on water. He grabbed the kid by the collar and said, “I have had it with you! Sit down, shut up, and learn. I could drag you to the principal's office and your coach, but I will find it more pleasurable to straighten you out myself. Get it?” No doubt this legend got stretched with its re-telling, but we believed every word of it.

What does all this have to do with discovering science? Back then, Vo-Ag classes did not involve as much science as today. In addition to Vo-Ag classes I took chemistry, but I avoided taking biology because I thought that all they did was memorize stuff. Isn't this a hoot? I ended up getting a Ph.D. in biology and taught it at Texas A&M for 16 years. And I got so interested in memory that I did research on memory and wrote a book to help students learn how to memorize better (see my Web site, thankyoubrain.com).

I didn't take physics, because I didn't think I was smart enough and because the teacher was the school principal, a gruff, bald old man who intimidated everybody. Actually, if I had it all to do over again, I probably would have chosen a career in physics. So many exciting ideas are now being batted around: time travel, parallel universes, dark matter, dark energy, big bangs, black holes, and all that sort of stuff.

Not surprisingly, all those FFA experiences and raising my own farm animals taught me to like animals and to care about what happens to them. It was natural for me to want to become a veterinarian to learn about diseases that affect animals and humans. So, by about the 10th grade, I knew what I wanted to do in college. I had been told that getting into veterinary school was competitive and that I had to learn of lot of science. I couldn't take any science but chemistry, because by then my schedule was packed. But I could make good grades, and I ended up as valedictorian with the highest grade point average of anybody in either the county or in Memphis schools.



“Dr. Bill, Memory Medic,” on his way to help students with their memory.

See <http://thankyoubrain.com>.
W.R. Klemm, D.V.M., Ph.D.

“Big Mac Attack” ...continued

My school’s biology teacher, Mr. Kelly, whose class I never took, liked to tell people that I wasn’t such a “hot shot.” My IQ was not all that great, he told people, and he predicted that I would have trouble in college. In college at the University of Tennessee, I made one C in math and another in genetics, but everything else was an A. And when it came time to pick the top 10 students in the state to go to Auburn’s veterinary school, I was number one.

I was not always a good student. Before middle school, I was a poor student (my 4th grade teacher got really disgusted with me). But my whole world changed in the 7th grade. It was in Miss Torti’s class. She was REALLY good looking, and I had a huge crush on her. The class had a girl who always made the best grades and was Miss Torti’s favorite student, you know, “a teacher’s pet.” So I vowed to win Miss Torti’s attention and favor by doing better than this girl. I eventually did. Miss Torti got away, but I learned that I could make good grades and that it felt good to do so independent of impressing others.

My first exposure to the scientific process was in a freshman botany course at the University of Tennessee. The professor, Dr. Sharp, actually taught the labs, instead

of a teaching assistant. I bombarded him with questions, usually dumb ones, but occasionally a few must have been profound (at least for a freshman who didn’t know anything about botany). Dr. Sharp urged me to forget veterinary school and become a scientist. But my experiences with Mr. Mac had convinced me that I wanted to become a practicing veterinarian.

Veterinary school taught me a lot about the facts of science but not much about the process of science — that is, doing research. Although I practiced veterinary medicine for a couple of years, I found myself reading scientific journals as a hobby. It wasn’t long before I was hooked, and I applied to graduate school to learn how to become a professional scientist.

Mr. Mac taught me something that is crucial for a scientific career: how to reach beyond my grasp and to take on challenges. I’ve been doing that now for over 50 years. The joy of seeing and understanding something that nobody else has ever done comes rarely in research. But when it does, the satisfaction cannot be matched by anything.

I can’t thank Mr. Mac enough.

‘What’s That?’ In Career Selection

John A. Shadduck

I was about 11, or maybe just turned 12. I told my Dad that I wanted to be a veterinarian, and his reply was “What’s that?”

My family had moved from the big city to a very rural area a few years before, and I became fascinated with farming. But, being a skinny little kid with no background whatsoever in farming, the more I thought about it, the more I thought that farming was just too hard. I had spent the last couple of summers “working” (what a joke!) for a local farm family and had seen how hard and long they worked. I loved every minute of it, but I could see even then that I just couldn’t keep up. In fact, I was just a kid trailing them around. Why they even put up with me I’ll never know, except for the fact that they were the most wonderful, caring and gentle people one could ever hope to know. They milked about 50 head, raised hogs and chickens, ran a big peach and apple orchard, and kept

a large vineyard for table grapes — plus the big garden, the usual hay and row crops, and all the other things folks did in those days on a true family farm in northeastern Ohio.



John Shadduck D.V.M., Ph.D was the Dean of Texas A&M’s College of Veterinary Medicine from 1988 to 1997.

I’m not sure I had even met a veterinarian at that time. Maybe I saw one come to the farm and maybe we took our dog to one to “get its shots,” but that would have been the extent of it. I guess my thinking was if farming is what I really want to do but think I can’t, what’s the next best thing? I also did well in school and knew that you had to get good grades and go to college for longer than usual to be a veterinarian.

Looking back on it, I was extraordinarily fortunate to have the parents I had. My mom was a school teacher, so she understood the value of education and doing well in school. My dad was a physical chemist with a Ph.D.

'What's That?' In Career Selection...continued

degree from the University of Chicago — one of the really fine universities at that time and now. He used to say that “chemists do very imprecise measurements on very pure substances. Physicists do very precise measurements on very impure materials, but physical chemists do very precise measurement on very pure materials!”

Dad knew even less than I about farming, and in fact worked in the city all his life. Even after we moved to the country, he drove more than an hour each way to work every day and stayed in town when the snow was too deep. He did not know about, and I suspect didn't care anything about, biology or animal health. But, both my parents supported me and my sister in whatever we wanted to try. They just insisted we do our best and that we try to be really good at whatever we tried. They expected us to get good grades, and we did, but they really emphasized learning, not grades. When I whined about “bad” teachers, my dad would say “no teacher can keep you from learning. Some make it easy and fun, and others don't, but you can learn no matter what.” He wanted me to quit whining, get to work, and stop thinking that the world was going to give me what I wanted. He made it clear that life is full of disappointments and it's up to you to make a good life and succeed, even if the “teacher is bad.” In fact, he had lots of disappointments in his life and never once complained about any of them. One of the biggest, I'm sure, was the fact that he was the third or fourth person to discover the neutron. Lesson: if you're going to discover something, it's best to be the first. Do you know who was the first to discover the neutron? If not, as my dad would tell you, “look it up.”

That was another thing about my folks. They did what they told us to do. In fact, something we say at my house to this day is, “Let's look it up, just for the fun of it,” because that's what my folks did when any of us had a question they couldn't answer. What a great way to get a start, having someone say “look it up!” Today it is so much easier to look things up, with computers and the Internet.

So, it was quite natural for my dad to ask “What's that?” when I told him what I wanted to be. He surely didn't have a clue, and, really, neither did I. We needed to “look it up.” I don't remember what I told him, but apparently he was satisfied, because later he and my mom helped me get a chance to ride with a local large animal practitioner, which I did for several summers beginning in seventh grade. The veterinarian was also supportive and encouraging and tolerated my presence with apparent good humor. Later, I joined 4-H, raised and showed a couple of Jersey heifers, and raised rabbits.

When I went to college at Ohio State, my plan was to

study pre-veterinary medicine, get into the College of Veterinary Medicine, and enter a dairy practice somewhere in the Midwest. I accomplished all but the last. Late in my third year in veterinary school, I caught the research bug — maybe planted by my dad? — and entered the graduate program. One big influence was an awesome professor who inspired me as a veterinary student. A scientist working with him had discovered a group of viruses that caused polio in pigs. This was when polio was a terrible disease of people. Everyone knew at least one person who had been stricken, and I knew several, including a girl in my grade school class. I became deeply interested in learning whether the pig virus also caused polio in people. (My experiments showed that it didn't, but it was a very bad disease in pigs.) As I advanced through my veterinary education, learning all I could about some things became more important to me than learning a little bit about a lot of things. So, research looked very exciting to me, and it was.

As it turns out, research and science were perfect for me. I have had a tremendous amount of fun learning new things, and on the rare occasions when something entirely new and unexpected shows up, I get goose bumps! Plus, I get to travel, have worked in several parts of our country and twice overseas, and have done many different things during my career. I even became a dean of a college of veterinary medicine, the one at Texas A&M University, and president of a small company in Colorado.

Although I didn't do exactly what I'd planned, it was all interesting, rewarding, and fun. My folks' teaching me to “look it up” served me extremely well the entire time. And, my dad and I both learned that the answer to “What's that?” was a varied, exciting career making life better for animals and people.



Veterinary school outreach offers youngsters and community members the opportunity to satisfy their curiosity with unusual specimens.

Dr. Barbara Gastel

Dr. Gastel is an Associate Professor of Veterinary Integrative Biosciences and of Humanities of Medicine at Texas A&M University. Dr. Gastel has a BA degree from Yale and MD and MPH degrees from Johns Hopkins. Originally a faculty member in the Department of Journalism, Dr. Gastel moved to the College of Veterinary Medicine and Biomedical Sciences in 2004. She then developed a biomedical writing course for undergraduates. She also coordinates the master's degree program in science and technology journalism and advises students in the master's degree program in biotechnology. Through her joint appointment at the Texas A&M Health Science Center, College of Medicine, Dr. Gastel also teaches medical humanities courses for first- and second-year medical students.



Dr. Gastel is also the editor of *Science Editor*, the periodical of the Council of Science Editors. Evident by her expansive teaching and mentorship responsibilities, Dr. Gastel is dedicated to education of undergraduate, graduate, and professional students. As an educator, Dr. Gastel is not exclusive to the university setting; she serves as a co-investigator on the NIH grant "Science Promotion in Rural Middle Schools."

Internationally, Dr. Gastel has co-directed a program to teach biomedical writing and editing in Asia and is participating in a new program, AuthorAID, intended to help researchers in developing countries to publish their work.

Her outreach activities at the K-12 level over the years have included presentations to middle school and high school students. Other outreach has been through her publications, which include books on teaching science and on writing about science.

Dr. Robert C. Burghardt

Dr. Robert Burghardt is a professor of Veterinary Integrative Biosciences at the Texas A&M University Veterinary School. He is also Chair of the Interdisciplinary Faculty of Toxicology and a member of the Interdisciplinary Faculties of Reproductive Biology and Biotechnology and the Center for Animal Biotechnology & Genomics. He currently teaches graduate students a variety of topics ranging from cell biology and cell signaling to optical microscopy and image analysis.

Burghardt's research interests include repro-



ductive biology, more specifically cell signaling and signal transduction during pregnancy recognition, implantation, and the onset of labor. He has served as the associate director of the Center for Environmental and Rural Health (CERH), supported by an interdisciplinary environmental health sciences grant focused on the impact of environ-

mental factors on human health, particularly as it relates to rural communities. Dr. Burghardt also serves as the director of the Image Analysis Facility Core, a part of CERH. He is involved in the training of graduate students and postdoctoral fellows. Burghardt has also visited local rural middle school science classrooms to promote science education and outreach.

Veterinary medicine is a field wrought by constant change. It must adapt to the needs of a transforming society and to the capabilities of emerging technology. The individuals featured here not only spark changes with their research and discoveries, but also relay the necessary adaptations to the next generation of veterinarians and veterinary researchers.

As professors at the Texas A&M College of Veterinary Medicine, this faculty realizes the prestige and responsi-

bility assumed by veterinarians in rural towns. Here is a look at some faculty members who are actively involved in outreach and service efforts around the university and community. Each has their own unique way of putting their D.V.M. and other advanced degrees to work and a unique outreach philosophy to share with their students. Through example and encouragement, these professors serve as role models for both students and community members.

Dr. Dickson D. Varner

Dr. Varner has been on faculty at the College of Veterinary Medicine and Biomedical Sciences, Texas A&M University, for the past 25 years where he is currently Professor and Pin Oak Stud Chair of Stallion Reproductive Studies in the Department of Large Animal Clinical Sciences. His appointment entails teaching, research, and clinical efforts and his area of academic focus is equine reproduction.

While Dr. Varner has an active schedule on site, he is also involved in consultation worldwide, where he assists with the veterinary management of breeding stallions. These travels have taken Dr. Varner from Europe to Australia and the experiences gained on these excursions have fortified his adeptness in teaching, research, and clinical proficiency.

Twenty-five years is a long time to be in one post, but Dr. Varner states that he would not trade the experiences and camaraderie gained at this university for any

other avenue of life. Dr. Varner believes that the key to longevity in any career is to have a deep affection and fascination for your discipline of choice. His parents were producers of a rodeo, Wild West show, and dude ranch, and his mother is in the Cowgirl Hall of Fame.

As such, it is easy to understand why the horse has become a focal point of Dr. Varner's professional activities.

Dr. Varner also believes that it is crucial to have interests outside the work environment to keep the mind vibrant. To that end, Dr. Varner still has not veered from equestrian activities, as he relishes time at home where he breeds and trains reining horses and working cow horses. He is also active on local, state- and national-level horse committees. Horses are not his only diversion

from the workplace; however, as he also has a keen interest in working with cows and dogs and, when time permits, a little harmonica playing.



“The key to longevity in any career is to have a deep affection and fascination for your discipline of choice.”

Dr. Louise Abbott

Dr. Louise Abbott is an associate professor in the Department of Veterinary Integrative Biosciences at Texas A&M University. Her current research interest is in developmental neurotoxicology. After receiving her Ph.D. in zoology, she sought a D.V.M. so that she could better identify with the veterinary students she would one day be teaching. Dr. Abbott has taught veterinary gross anatomy, veterinary histology, and veterinary embryology, and she currently teaches various neuroscience topics to both graduate and undergraduate students.

By choosing teaching and research as a career, Dr. Abbott has gained much experience not only teaching undergraduate and graduate students, but also mentoring them in a laboratory setting. "Once trained in lab procedures, students can help to further the research productivity of the lab," Abbott says, "but the primary benefit is to the student. They get to see what it's like to do real science." For Abbott, it is important for her students to learn how to interpret scientific information even if they do not choose to enter a science-related career.

In addition to the several university students she



mentors, teaches, and advises, Dr. Abbott also reaches out to K-12 students. She has served as a mentor for high school students in the NASA Summer High School Apprenticeship Research Program (SHARP), a program designed to pair high school students with active researchers to stimulate career interests in science and engineering. In addition, Abbott has served as an event coordinator for

the Texas Science Olympiad, and she has visited middle schools to give presentations on mercury toxicity.

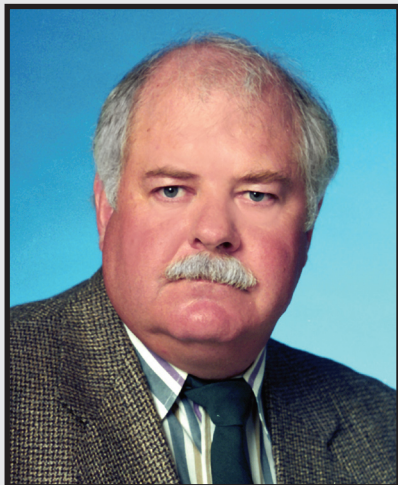
Beyond sharing her knowledge and time with students, Dr. Abbott gives back to the community through her commitment to community involvement and service. Abbott has served as member, vice president, and president of the board of directors of Twin City Missions, a community service organization in the Bryan/College Station area. For

Abbott, outreach is about quality rather than quantity.

"Outreach to the community can sometimes be difficult, but I try to do a few things and I try to do them well," she says. Further, Abbott advises, "Try to find something that interests you and stick to doing that."

Dr. G. Kent Carter

Dr. G. Kent Carter is a professor of Large Animal Internal Medicine in the Department of Large Animal Clinical Sciences at the Texas A&M University Veterinary School. Carter received a D.V.M. from Colorado State, and an M.S. in Veterinary Medicine and Surgery from Texas A&M University, and he is a Diplomate in the American College of Veterinary Medicine. His current research interest is in equine lameness.



As a supervisor of clinical rotations in equine lameness, Carter aids third and fourth year veterinary students in clinical development, and he coaches them on how to use the clinical setting as a means of education for students.

As a licensed veterinarian, Carter uses his clinical experience to take advantage of many opportunities for outreach. Carter serves on the board of directors for the American Association of Equine Practitioners and also serves on the Texas State Racing Commission. In addition, Carter started an outpatient lameness service in 1994. He also devotes much time to his telephone consultation service, through which he provides specialist advice to veterinarians in private practice and at other veterinary colleges regarding equine lameness and internal medicine. Carter is actively involved in sharing his knowledge and expertise with the public and has appeared on local television programs to present information on equine lameness and horseshoeing.

Dr. Ian Tizard

Dr. Ian Tizard is the Richard M. Schubot Professor of Exotic Bird Health in the Department of Veterinary Pathobiology at the Texas A&M University College of Veterinary Medicine. Dr. Tizard is the director of the Schubot Exotic Bird Health Center, an endowed branch of the Department of Veterinary Pathobiology, whose focus is to improve the health of wild and exotic birds by promoting research into the causes, diagnosis, and prevention of their diseases. Dr. Tizard teaches at the undergraduate, graduate and professional levels, and he is particularly invested in the university experiences of his undergraduate and graduate students. He has served on numerous curriculum development committees, teaching excellence committees, and the Committee for Improving the Undergraduate Honors Experience.

Beyond his commitment to teaching, Dr. Tizard is an avid and devoted researcher. His research interests include comparative avian and mammalian immunology, the evolution of the immune system, avian diseases, and the role of infectious diseases in wild bird populations.



In addition, Dr. Tizard studies the use of vaccines as a means of promoting health care and has devoted much research to developing vaccines to be administered through routes other than injection.

As an accomplished professor and researcher, Dr. Tizard has received numerous awards for his teaching excellence and research contributions including the Texas A&M University Distinguished Lecturer Award, the American Association of Veterinary Immunologists Distinguished Contributions to Veterinary Immunology Award, and the American College of Veterinary Microbiologists Outstanding Veterinary Microbiologist Award. Dr. Tizard also promotes scientific awareness and interest among the public, teachers, and students.

In a society dominated by science, Dr Tizard feels “there is no better way to influence society than by being a scientist.” For Dr. Tizard, “the strength of science is in the sharing of it,” whether with other scientists or the public. “Science does not exist in a vacuum,” explains Tizard. “Science is part of our society,” which means society should be engaged in judging and analyzing it.

Dean Eleanor M. Green

As dean, Dr. Eleanor Green serves as the principal academic leader and chief executive officer of the College of Veterinary Medicine & Biomedical Sciences. The college is one of 31 colleges of veterinary medicine in the United States and Canada, enrolling nearly 500 students in its doctor of veterinary medicine program, as well as more than 2,250 students in its undergraduate biomedical science program and more than 150 graduate students in a variety of research programs. Green is responsible for the management of five academic departments and the Veterinary Medical Teaching Hospital.

She is a Diplomate of the American College of Vet-



erinary Internal Medicine, Specialty Internal Medicine, and a Diplomate of the American Board of Veterinary Practitioners, Certified in Equine Practice.

At the University of Florida–Gainesville, Green served as professor and chair of the Department of Large Animal Clinical Sciences in the College of Veterinary Medicine. Before joining the faculty at the University of Florida, Green was professor and head of the Department of Large Animal Clinical Sciences and director of the Large Animal Veterinary Medical Teaching Hospital at the University of Tennessee in Knoxville. She has also served on the faculties of the University of Missouri College of Veterinary Medicine and the Mississippi

State University College of Veterinary Medicine.

Dr. Anton Hoffman

Dr. Anton Hoffman is a clinical associate professor in the Department of Veterinary Integrative Biosciences at the Texas A&M University College of Veterinary Medicine. Dr. Hoffman received a bachelor's degree in veterinary science, a D.V.M., and a Ph.D. in veterinary anatomy from Texas A&M University. Although he had a small animal practice for a short time, Dr. Hoffman has devoted much effort and time to teaching students, both undergraduate and professional.

It was during graduate school while working as a teaching assistant that Dr. Hoffman discovered his passion for teaching. At the undergraduate level, Dr. Hoffman teaches biomedical anatomy, and for professional students he offers courses in gross anatomy, neuroanatomy, and surgical techniques. Dr. Hoffman has also developed a canine radiographic anatomy computer program designed for veterinary students and practitioners, and he is working on getting the program published. Further, Dr. Hoffman is a medical illustrator for textbooks, manuscripts, and presentations.

For all of his efforts and accomplishments in university teaching, Dr. Hoffman has recently re-



ceived the Carl J. Norden Distinguished Teaching Award and the John H. Milliff Award for teaching.

In addition to his dedication to teaching at the university level, Dr. Hoffman is involved in education in the community. He has presented talks on veterinary anatomy and medicine to local 4-H clubs and middle school classes, particularly to students in the AVID (Advancement Via Individual Determination) program. AVID is a program that prepares economically disadvantaged students in grades 4 through 12 for college eligibility and success. Also, Dr. Hoffman previously designed and coordinated Youth Adventure Programs in veterinary medicine, through which K-12 students experience the Texas A&M Vet School by means of presentations, observations, and hands-on activities.

"Every time I go to my wife's middle school, it's a memorable experience," says Hoffman. "The kids really are excited to learn about veterinary anatomy."

To those debating whether to get involved: just do it. "You will always get calls," Hoffman says, to visit a classroom or make a presentation. "It's real easy to say 'I'm busy,' but just do it. It will never be a bad experience."

Dr. Christine Budke

Dr. Budke is an assistant professor in the Department of Veterinary Integrative Biosciences at the Texas A&M University College of Veterinary Medicine. She holds a D.V.M. from Purdue University and a Ph.D. from the University of Basel. Further, she has attended University of Zurich as a graduate and postdoctoral research assistant in the Institute of Parasitology. Currently, her research interest is in parasitology, and she specializes in parasitic zoonoses such as echinococcosis. She has worked on research projects to evaluate the transmission of echinococcosis on the Tibetan plateau and traveled to China to present her findings on the disease's prevention and control.

As a member of several professional organizations dedicated to epidemiology such as the International Society for Veterinary Epidemiology and Economics, Dr.

Budke is committed to providing opportunities for furthering education to those in the scientific field. Beyond this, Dr. Budke is enthusiastic about educating youth to stimulate interest in science. She recently participated in the Duke TIP Introduction to Veterinary Medicine course, during which she presented lectures to middle and high school students on zoonotic diseases (diseases transmitted from animals to man).



Dr. William Moyer

Dr. William Moyer is the head of the Large Animal Clinical Sciences Department at Texas A&M. His current specialty and research interest is sports medicine and lameness. As a student at Colorado State University, Moyer played football to make his way through school while pursuing a bachelor's degree in agricultural sciences. When it came time to choose a career, he gravitated toward what was natural and chose to become a veterinarian in order to practice sports medicine on race horses. "It involves treating the athletic injuries of race horses in order to allow them to perform better," says Moyer.

As a veterinarian, Dr. Moyer has experienced both the clinical and research aspects of the field. Moyer taught classes in farm animal medicine to 4-H students as a vet student, and



he taught musculoskeletal corrective shoeing to grad students before becoming the department head at Texas A&M. Moyer also had his own private practice for several years. During this time he was able to contribute a great deal to the youth of his community. "Each case involves kids" he says. Naturally, young people show a lot of interest when their own animal is sick. "As a practicing veterinarian, you are in the presence of young people a lot and social interaction with them is a constant."

Moyer recalls hiring kids during summer breaks and holidays as extra hands. Not only is this a way to obtain some help around the practice, but it also further develops an interest in them to pursue a career in veterinary medicine by allowing them to take an inside look at it.

Dr. Nancy Ing

Dr. Nancy Ing is an associate professor in the Departments of Animal Science and Veterinary Integrative Biosciences at Texas A&M University. Her current research interest is in the actions of steroid hormones; more specifically, how estrogen up-regulates the estrogen receptor gene. With a D.V.M. degree, a Ph.D. degree in biochemistry and molecular biology, and postdoctoral work in cell biology, Dr. Ing truly understands the benefits of research and teaching.

As a veterinary scientist and teacher, much of her time is spent teaching laboratory classes for undergraduate and graduate students. In addition, she advises undergraduate and graduate students interested in pursuing independent studies in gene expression. Dr. Ing enjoys working with students in the laboratory because "They make everyday unusual. They have a lot of



vitality and new ideas." She also teaches graduate level lecture courses in molecular endocrinology. Not only does Dr. Ing use her expertise to teach graduate and undergraduate students, but she also

serves on several editorial boards, such as those of the journals Domestic Animal Endocrinology and Biology of Reproduction, to promote the publication of research. "This profession requires you to be a life-long student, so I try to keep my learning active," says Ing.

Dr. Ing also takes advantage of many community outreach opportunities. She visits local schools, particularly middle schools, to talk about the problems and consequences of the use of some common drugs, such as tobacco. Most importantly, Dr. Ing advocates the sharing of scientific information with young people.

"We cannot forget the young people because they are going to be our future scientists."

In rural towns, veterinarians tend to be among the most educated, most science-oriented role models in the community. Their involvement in civic activities helps pave the way for youth interested in pursuing careers in medicine, research, or related fields.

For many veterinarians, giving back to the community is a natural part of the job. They go to schools to teach about animal safety and other topics. They use their



Veterinarians and Scientists in Secondary Schools

clinical roles as a means of improving the lives of those in their community.

The following veterinarians regularly visit public school classrooms to share their knowledge, to mentor students, and to improve education otherwise. Their stories are indicative of the roles of many veterinarians across the nation who dedicate their time and energy to improving their communities. As experienced classroom visitors, they discuss how rewarding service can be and offer their advice about how to make public school visits interesting and fun.



When the kindergartners came into the room, all they saw was a man in scrubs with a stethoscope. It was not until he started talking about what it meant to be a veterinarian that the students realized there were a cage and a fluffy white dog at the front of the room. A wave of “oh’s” and “ah’s” swept through the class.

The man presenting was Dr. Greg Wood, a small animal vet in Katy, Texas. His presentation consisted of a half day of talking to kindergarten classes about pet care, the importance of good grades, and the life of a veterinarian. Wood is one of the many veterinarians across Texas who visit local schools to encourage youth to pursue their goals.

Wood, who has been visiting classrooms since 1989, got started by writing letters to schools offering his time. “My most successful thing was addressing my letters to the principal, letting them know that I was available,” said Wood.

Dr. Julie House is a veterinarian in San Marcos who started visiting public schools several years ago, when her children were young. “Either I had a client that was a teacher or my child’s teacher asked me if I would be interested in helping out,” House said.

In other cases, the impetus for involvement comes from a need in the community. Dr. John Clader of Pleasanton started going into schools in the 1970s following a rabies outbreak. Clader’s rabies prevention training made it possible for him to teach the community how to avoid a sick animal and what to do in case of a bite. Since that time, Clader

has volunteered to speak numerous times on topics ranging from veterinary medicine to leadership to pet care.

Presentation topics depend on the grade level involved. Wood’s presentation at an elementary school in Katy focused mainly on the importance of taking care of pets, with only brief discussions on the science of being a vet and potential career choices.

“You realize that with a kindergartner through second grader, you have about a five-minute attention span,” said Clader about his experiences. “I usually bring a dog with me because the students are going to focus on the dog.” Discussion then revolves around taking care of the dog, health problems dogs can have, and similar topics.

As students get older, visiting vets are freer to talk about technical aspects of their profession. Many times, the conversation depends on what type of specimen the vet has brought from the office. Items that include a “gross” factor, like a worm-infested heart, urine from an animal with urinary problems, an x-ray of an animal that has swallowed something, or anything preserved in a jar, tend to keep students’ attention.

“You can use sophisticated terminology (for older students) because they have enough science and math to be able to understand more things,” said Wood. Understanding is coupled with more maturity, so vets can discuss the emotional aspects of what they do.

Sometimes teachers try to tie in aspects of the vet’s presentation with a math or science lesson. House has had

Dr. John Clader

Class of ‘72: Animal Science
Class of ‘73: Vet School

Large and Small Animal Practice
Jourdanton, Texas.

Has been visiting schools since 1976.

“In a rural or semi-rural practice, you’re not just the dog and cat doctor for people with discretionary income. You have a relationship with the community. It’s a trust element that you don’t want to violate. So, giving back to the community is what this is all about. And, one of the obvious places is in the schools.”



All in a Day's Work...continued

teachers ask her to discuss how she uses algebra in her job. Other times the lesson deals with a particular science topic.

Each vet tries to stress the importance of taking care of pets, but many have more far-reaching messages. "The main thing is the importance of education in whatever you do," said Wood, who discussed with students the extra years of education necessary to become a vet. Dr. Clader's most important lesson is, "You've got a brain. Use it. You can do anything you want if you put your mind to it." For Dr. House, the most important thing is to instill a love of science in the students. "I think back to when I was their age and how wonderful it would be if someone came into my classroom with a dog and we talked about dogs all day."

The students are not the only ones who benefit from visiting public schools. "You realize that when you were a kid, a lot of adults, outside of your mom and dad, had a big influence on who you are. We've got chances to do that here, and it's kind of fun," said Clader. Wood found that simply interacting with the students and teachers and being able to answer their questions was rewarding for him.

For House, the most important thing is giving students an opportunity to enjoy science. As a kid, House would cut up a chicken's heart while her mother cooked the rest of the bird. "I have a love for science and math and a cu-

riosity about how things work. As a kid, I was always trying to get the puzzle pieces to fit together. I want to help others enjoy that aspect of life."

More than that, some veterinarians feel their involvement goes beyond simply giving back to the community. "This is not about promoting our practice," said Clader. "It's about promoting veterinary medicine both as a technician

and as a veterinarian."

...simply interacting with the students and teachers and being able to answer their questions is rewarding.

As the class period ended at the elementary school in Katy, Dr. Wood opened the floor for questions. Some students wanted to tell stories about their pets, but Wood redirected their attention by using their stories as stepping stones to a new discussion.

After class, a few students approached the front to talk about their own pets or what they thought about vets. Wood fielded their questions and talked about being responsible students and pet owners.

The students filed past the cage with the white fluffy dog. The teachers presented Wood with a small gift bag and thanked him for his time. Wood left right before noon to return to his clinic, having spoken to more than 100 students about how many possibilities their futures could hold.

Dr. Greg Wood

Class of '81: Animal Science
Class of '84: Vet School

Small Animal Practice in Katy, Texas.

Has been visiting schools since 1988.

"A student once asked, 'Do you ever make mistakes?' I said, 'Sure, everybody does. You just try and learn from it.' The first time I ever got that question, it just kind of put me in panic mode."



After initial visits in the classroom, veterinarians may develop lasting relationships with students and teachers.

High school teacher Huntyce Moore has participated in various outreach programs with Dr. Greg Wood, including a career awareness day and several in-class visits.

Wood's presentations consist of showing specimens (like a radiograph of a dog that swallowed a golf ball), talking about dogs and their health problems, and discussing what it takes to become a vet. Wood leaves time at the end of the presentation for interaction with students. "He had time for questions and answers, which is very important," said Moore.

Moore stressed the importance of the vet being a real person. "It helps when he tells students what areas were hard for him. Vets are not just brains that gobble up classes before they become vets. They're real people."

High school students, especially, can reap the benefits of vet visits. "Vets help students realize that what they are learning in the classroom has applications in the real world," said Moore. Moore tied Wood's visit into her classroom lessons. "For example, if a dog swallows something acidic, we're not just talking about acids and bases. His visit gave purpose to what they were learning."

Wood's visit also helped students learn the value of their education. "They learn an appreciation for the class work they're involved in and how they can attain their goals. Their studies in high school really do have a long-range purpose," said Moore.

Pam Dever, a teacher in San Marcos, has had Dr. Julie House come to her classroom for the past twelve years. House's visits help students understand more about the world around them. "The kids get a wonderful, hands-on experience with a pet, which is a good visual aid," said Dever.

House usually takes her family's pet Labrador retriever, Rose, along on her visits. She also brings specimens from her clinic to reinforce lessons. "The kids really understand what kinds of things could happen to their pet," said Dever.

In addition to pet care, Dr. House talks about her career. "The visit gives students an idea about the potential they might have for a job in the veterinary field," said Dever.

To connect the activity to classroom learning, Dever hosts a "pet parade" in her class, where students (with a parent) bring their pet on a leash and receive awards for things like "longest ears," "softest fur," or "goldest fish." The class also reads books about vets before the visit so they are ready when the vet is in the classroom.

The goal of the visit is to introduce students to veterinarians in a way that will make a lasting impression, regardless of what career the student chooses.

"We tell the kids: it is science, and it is a job," said Dever.



Dr. Julie House

Class of '85: Animal Science
Class of '88: Vet School

Small Animal Practice in San Marcos, Texas

Has been visiting schools since 1988.

"I was one of those kids that obviously liked animals, but I was different. I was always interested in the science behind it, too. I think back to when I was their age and how wonderful it would have been if somebody came into my class and we spent the day talking about a dog or something like that."

"Focus not only on the ones that think it's cool and exciting, but try to spark an interest in those that aren't really sure what they want to do."

For those interested in visiting classrooms on their own, there are some things to remember to help make the visit more enjoyable.

"I think the key is in the communication with the teacher and finding out what she wants," said Dr. House. Getting input from the teacher can help identify classroom needs and focus on topics of conversation. If the teacher does not have a specific topic in mind, it helps to bring specimens from the clinic.

"It doesn't need to be fancy," said Dr. Clader. "Kids don't need visual aids. They don't need films. Try to speak to the smallest number possible and to involve them early on in the discussion. Ask them questions."

All the vets interviewed brought the family pet along on visits. Each stressed the importance of choosing an animal proven in crowds, usually a dog (cats are less social and can present more of an allergy problem). Pets were also cleared with school administration and the teacher before the visit.

Preparation varies from one vet to another. Sometimes the teachers want specific topics, so presenters can mold their discussion around a key concept. Other times, there is no set discussion, so the visiting vet is free to talk about whatever he or she wishes. "It's really off the cuff," said Wood. "I start talking about what I think is important and try to get to the right level of whatever grade I'm talking to."

For House, preparation is key to her presentations, but she is always open to trying new things. "On one visit, I took all these specimens to look at under a microscope. I got there and realized that the school's equipment wasn't good enough to use. So, I moved away from the specimens and focused on some other thing."

Teacher involvement is also key to a smooth presentation. Some vets involve the teacher in the demonstration, asking them to hold an animal or using the teacher's questions to redirect student attention. When the teacher is not helping and the class is starting to get noisy, Wood usually says, "Okay guys, quiet down or we can't hear the question." For younger groups, Wood draws an imaginary line for students to stand behind so that they do not get too close to the animal.

House tends to ignore disruptive behavior, letting the teacher handle students. "You have to select your audience," she said. "Forget about the ones that aren't paying attention, and just deal with why you're there. Focus on the ones that care."

Former Student:

Dr. Joe Gillespie does dairy consulting and is a large animal vet specializing in dairy cattle and large herds. His first exposure to Dr. Clader was in junior high, when Clader gave a presentation to his class about careers in vet medicine. Four years later, Gillespie started working in Clader's clinic during the summer and Christmas break.

"After his presentation, I became more interested," said Gillespie. "When I got older, I realized I needed some mentorship, so I got a job with his clinic. From there on, I knew I wanted to go into vet medicine."

Since that time, Gillespie has continued Clader's tradition and begun bringing high school and college students into his clinic for training. "I learned a lot about being a good mentor from him," said Gillespie. "You saw both sides of the job so that you could make a better decision about whether or not that interested you."

In fact, most students are interested in vet presentations. Doing small things like speaking on their level can help students comprehend complex ideas. "Speak to them as you would speak to a client or a friend," said Clader. "Do not use any medical terminology."

Acknowledging the difference between students and teachers is also important. "Sometimes you have to switch gears when a teacher asks a question," said Wood. "You use a different level of conversation than you do for the kids."

All agree that involving students in the discussion is very important. "Ask questions early and often," said Clader. "It doesn't need to be fancy."

For students who are particularly involved, one-on-one discussion following the presentation is the best way to answer their questions. "Don't stop the whole lecture for one kid," said Clader. "Wait until after, and tell him to come out to the clinic. Really sit down and counsel him." Clader regularly takes on high school student interns that he and his staff mentor. Similarly, Wood participates in community outreach programs where he closely mentors local students.

For those wanting to simply visit the classroom to talk about veterinary medicine, the best advice came from Dr. Clader: "Make sure your pants are zipped!"

Getting involved in the community can be fun and fruitful for science role models such as veterinarians. For science role models, public school outreach is one of several opportunities for community involvement. Not only is public school outreach an enriching experience for the students, but it also provides long-lasting benefits to the visiting veterinarians and scientists.

You may ask, why public school outreach? How will visiting a local classroom to give a presentation benefit the students or me? First, visiting public schools confers increased publicity from newspapers, schools, and the local

As a veterinarian, you have an ability to improve education in public schools and to motivate students to make early science career choices. Through demonstration of your knowledge and skills, you have the capacity to stimulate critical thinking, a valuable skill for students of any level. Further, you may motivate students to take positions of leadership. You will also demonstrate the rational use of the scientific method and prove the importance of using it every day. Ultimately, by stimulating use of the scientific method, you will be encouraging the students' enthusiasm for research. Your presentation may also spark students' interest in pursuing science or medical careers.

Public schools are an excellent venue for interacting with youth. To contact schools, it is a good idea to send a letter to a teacher, the principal, or the superintendent expressing your interest in getting involved with their school. You may even want to attend a local PTA meeting or invite a class to your clinic or lab for a field trip in order to establish contacts with teachers and students. Many schools send out requests for scientific input for after-school programs or need experienced scientists to serve as science fair judges or advisors. These are both

great opportunities to volunteer your time. Donating supplies, such as models or lab equipment, is another important means of getting involved in the education of your community's youth. Finally, simply attending career day and offering biomedical science career counseling are valuable resources for local schools.

There are several topics you can present as a veterinarian. Students will be eager to learn about your life as a veterinarian, your career path, or the preparations you made to become a veterinarian. For more advanced students,



Dr. Johnson presents specimens of preserved respiratory organs to intrigued middle school students.

community to give you instant recognition. Further, this is an opportunity for service in its most desirable form, the education of youth. Visiting local classrooms may also increase your awareness of public health issues and can assist in narrowing the focus of your veterinary treatment by identifying the most critical client needs. Lastly, participating in this valuable form of interaction with community youth gives students an opportunity to make instant connections with role models to foster the development of their science interests and career paths.

Science Role Models in Public Schools...continued

why not present your area of study and current research in the veterinary medical field? Also, hands-on classroom experiments are always a hit. If you are not sure how to approach your presentation, just keep it simple. Bring props from your clinic and try to relate them to what the students probably already know. Or, help the students relate what they have learned from their teacher (curriculum) to public health or veterinary medicine. If you start with what the students already know, it will boost their confidence and encourage their participation in your presentation.

There are just a few things you need to know before venturing in to the classroom. First, the time and timing of your visit are critical. Most school class periods are 45 minutes long, but some are 90 minutes, so be sure to check with the school before putting together your presentation. Also, many teachers have trouble adding to their very strict and structured curriculum; teachers will really appreciate it if you present something that enriches their current curriculum, rather than straying from it. As much as you can, be creative in the way you present your material. Bring props from your clinic, or even a well-trained animal to get (and keep) the students' attention. And of course, always have fun and enjoy the interaction you are having with the youth of your community. Finally, be sure to encourage entry into college to obtain biomedical-related degrees.

Surely participating in this unique opportunity to interact with young students will go above and beyond your expectations. As a role model in your community, expect to see engagement from the students and appreciation from the teachers. You may even get a few requests from the class to visit your clinic. By being a source of knowledge and stimulation, you are revealing potential career opportunities, the excitement of research, and the importance of critical thinking skills to students who will soon be choosing their career paths and life goals.

If the thought of presenting in front of youth leaves



As students examine a preserved specimen they ask, "What is the butterfly-shaped structure in the pig's nose?"

you a little intimidated, here are some tips to make the experience a little more enjoyable for you. First, make them laugh! Tell them some stories about funny animals you have treated or pets you have owned to make the atmosphere more relaxed for you and the students. Also,

remember to speak to them on their level. Some students will have a firm understanding of the terms and topics you describe, but others will not; remember to keep in mind the grade and maturity level of your audience and always encourage questions.

As a visiting veterinarian, you are doing a great service to your community. Your presence at a public school exposes students to the world of research and to the lives of veterinarians. Also, your presentation shows students that veterinary medicine involves investigation, imagination, intuition, the use of your hands, and thinking on your feet. Not to mention, you will be

promoting biomedical career choices that are full of excitement and opportunity,

and showing students first-hand how veterinarians help their communities by getting involved in public school education.



Dr. Johnson asks for volunteers to help demonstrate the function of the lungs and the effects of smoking.

Veterinarians who want to go into public schools but are not sure which topics to discuss can use PEER's curriculum as a guide. Numerous lessons are available (animal research, clinical trials, infectious diseases, physical exams, etc.) and can be viewed and downloaded from our web site, peer.tamu.edu.

The purpose of these interactive lessons is to help veterinarians develop positive community relations with little or no set-up on their part. As science role



The Veterinarians' Black Bag

models, veterinarians can effectively bridge the gap between classroom learning and real-world, practical applications. Each Vets' Black Bag lesson tries to tie the everyday experiences of veterinarians to important science and human health consequences.

Similarly, teachers can use the follow-up lessons to stimulate student interest in science, and can use the pre- and post-tests to evaluate the students' learning. The presentations can be given in full or in part. There are also worksheets accompanying each unit to help students retain the content.



When you go to speak to a group of kids, you never know how they will react. You really want them to be rapt with attention and for all of them to be changed forever by your words, but let's be realistic, that isn't going to happen. I simply hoped that the kids would be quiet and that maybe a couple of them would ask a few questions. Well, they went above and beyond my expectations.

To help ensure a positive experience, I decided to work my part-



Veterinary student Kristey Reed, accompanied by her yellow lab, Bailey, ventured into the classroom to teach students about the use of animals in research.



Eager and interested middle school students gather around a veterinary student to observe a simple demonstration of the effect of fluoride on teeth.

ner, my yellow lab named Bailey, into the presentation. It's always been my experience that nothing will grab someone's attention like a big happy dog. Well, Bailey got them focused on the topic like no one else could have, and the kids were wonderful! Most were very quiet and attentive. They also asked wonderful questions! I never expected them to be so insightful.

When you are speaking on a somewhat "taboo" topic, such as animal research, you could be asked a whole variety of questions and there is the potential for some of the questions to be a little uncomfortable. Luckily for me, all of the kids seemed to be open to the ideas in my presentation about what we gain from animal research. I really wanted to focus on the benefits that both people and animals enjoy. This was accomplished by putting Bailey through a physical exam. Each time I came to a different body system on Bailey, we would talk about how animal research has helped both people and animals by bringing about some medical advancement with that system. For example, after I listened to Bailey's heart, I explained how heart transplants were performed in dogs before they were performed in people. We hear about advances in human medicine almost nightly on the news. However, it is not mentioned that these advances would not be possible without animal research. What was even more fun to point out to them, though, was how animal research helps animals as well. People never think about the benefits of research for animals, and so it is easy for it to seem selfish for people to use animals in research for our own gain. I feel that the students I visited have a better understanding of what is truly gained from animal research. Through the use of props and my trusty sidekick Bailey, I was also able to show them some of the advances that have been made in veterinary medicine. After each presentation, the kids would ask questions on topics ranging from animal research to vet school to animal care. I was truly impressed by the quality of some of the questions. It was wonderful! I really felt that they were benefiting from the presentation.

I spoke to five classes, and by the end of the day I was exhausted! After speaking for five or six hours, my voice had started to give out and my

Veterinary Students Use Black Bag in the Classroom...continued

feet were killing me. With the last class of the day, the kids weren't quite as attentive. They were all ready to go home and start their afternoon. But there was one kid who sat in the front of the class, pet Bailey's ear as she slept on the floor, and never took his eyes off the screen. After the presentation he asked me a few questions about animal research and about becoming a vet and it just felt like I had maybe had a small influence on him.

That is a great feeling to think that you might have caused a kid to consider veterinary medicine and animal research in a new way. That makes the whole day and the months of preparation leading up to it well worth it. As I was walking to the car with the teacher, one of her students yelled goodbye to Bailey and me from the bus ramp. After I got in the car, I decided I would definitely be willing to do this again.



An Hoang, a veterinary student, gives a Black Bag presentation on heart worms to a sixth grade science class.

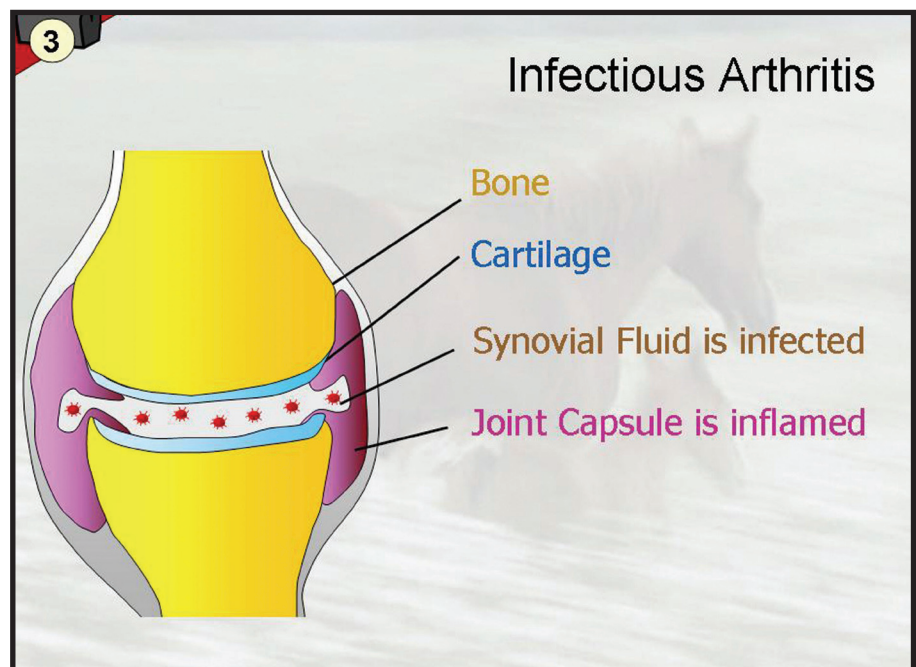
The Veterinarians' Black Bag Lessons

Jan Fechhlem

As part of a veterinarian outreach program sponsored by Texas A&M University, Lea Walker, a former student at the vet school, came to my 6th grade science classroom to present a Veterinarians' Black Bag unit. The topic was arthritis in animals and humans.

The presentation was very well organized. Considering that my students knew only the very basics of animal anatomy/physiology, I was pleasantly surprised at how well they understood the presentation. I was particularly pleased that the topic was one with which many students had some experience. A few students mentioned how their dogs had problems with arthritis, and quite a few mentioned that they had a family member with a similar problem. This made the whole topic much more relevant for them and increased their engagement in the entire presentation.

One follow-up activity that was very well received was where the students actually made working models of a joint and were able to show



Veterinarians present PowerPoint presentations on several medical and veterinary-medical topics to middle school classrooms as part of the Veterinarians' Black Bag Program.

what actually happens in the process of arthritis. The model, made out of wooden dowels, clay, plastic wrap and rubber bands, was a surprisingly excellent representation of a joint!

While the topic of arthritis or any type of joint problems is not in our 6th grade curriculum, the lesson provided a wonderful opportunity to examine the use of models in science, which is one of the curriculum objectives covered in 6th grade science. Not only was it a good example of one of the reasons why we use models (that is, because the actual object cannot be viewed in a classroom), but it led to a rather vigorous discussion in the class about the limitations of some models.

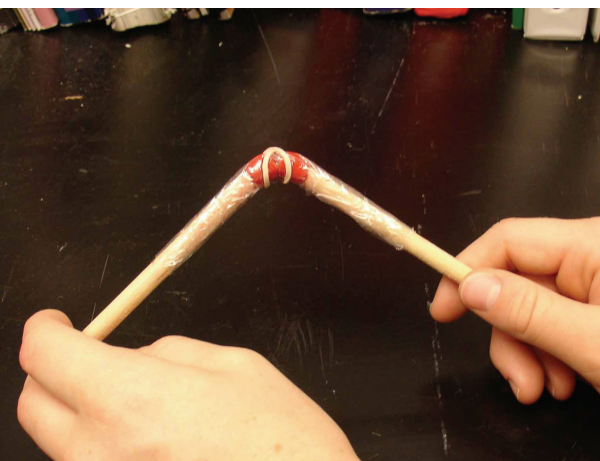
While the topic of the presentation is not in our 6th grade curriculum, the follow-up lesson provided the perfect opportunity to examine the use of models in science, which is one of the curriculum objectives covered in 6th grade science.

After the presentation and the follow-up lessons, students had a number of questions and comments. Several commented to me that they never realized that veterinarians did things like treat dogs for arthritis. As one student put it, "I thought all they did was give dogs shots and flea medicine!" Others were surprised at the connections between medical problems in animals such as dogs and horses and the same problems in humans.

Several students remarked that they never really considered that other animals could get the same illnesses or have the same medical problems as humans do! In the days following the presentations, several students asked whether Ms. Walker was going to come back, as they had questions concerning their own household pets. Several students made rather acute observations of the movements of their dogs and were suspecting arthritis was the problem. Another student remarked on how sometimes her dog didn't like bright lights and loud noises while at other times they didn't bother him. This led her to wonder if dogs could get migraine headaches, as her aunt does.

Overall, this was a very worthwhile experience for my students, and I look forward to another veterinary student visit next year.

Overall, this was a very worthwhile experience for my students, and I look forward to another veterinary student visit next year.



Students can use simple everyday materials to construct joints and model arthritis.



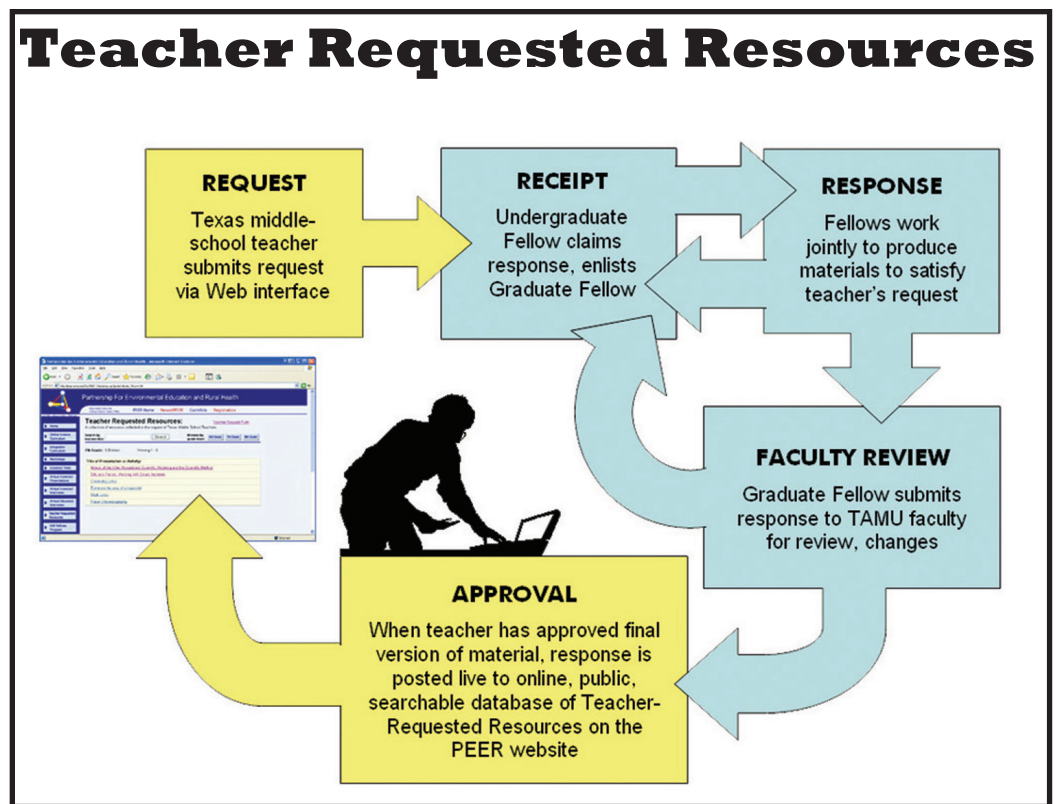
Jan Fechhlem

Mrs. Fechhlem is a sixth grade science teacher at Cypress Grove Intermediate School in College Station, TX, where she was named teacher of the year in 2005. Not only is she going on her 20th year as a science teacher, Mrs. Fechhlem is also an accomplished scientist with a bachelor's degree in marine science and biology from Southampton College of Long Island University and a master's degree in wildlife and fisheries sciences from Texas A&M University. She has promoted K-12 university outreach by hosting several Texas A&M graduate students and scientists in her classroom.

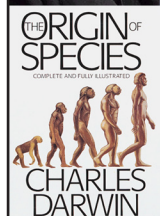
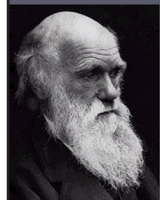
Through the collaboration of undergraduates recruited from the Texas A&M University Honors Program, PEER graduate fellows, and Texas A&M faculty, PEER offers a unique service designed to respond to teacher requests for educational resources. Teachers log on the PEER website at <http://peer.tamu.edu>, submit a request for a lesson plan, classroom activity, or other resource, and undergraduates work together with graduate students and faculty to fulfill the teacher's request. Each activity, lesson plan, or demonstration created is then reviewed and approved by teachers.

The Teacher Requested Resources service is unique in that it is completely driven by the needs of teachers. When one teacher requests a resource, there are likely several other teachers nationwide who are in need of the same thing.

For this reason, the collection of previously created Teacher Requested Resources is searchable from the PEER website and accessible to anyone. Visit the PEER website at <http://peer.tamu.edu> and click on the "Teacher Requested Resources" link to view our collection of lesson plans, classroom activities, and demonstrations. Browse by subject or grade level, or search the collection for key words. If nothing in our current collection fits what you are looking for, click on the "Submit A Request" button and tell us what you need.



CHARLES DARWIN, THE FATHER OF EVOLUTION (1809-1882)



- ▶ He was an English Naturalist
- ▶ He traveled around the world on his ship, the *Beagle*
- ▶ Studied species and fossils in the Galapagos Islands and around the world
- ▶ Why did some species survive while others became extinct?
- ▶ **Natural selection**
- ▶ Published *The Origin of Species* in 1859

One of the Teacher Requested Resources that the PEER team has received is the controversial topic of Evolution. An informative PowerPoint presentation and an activity to accompany it was created in response to the request. The PowerPoint covers topics such as Darwin's theory of natural selection, an overview of Darwin's finches, convergent, divergent, and co-evolution, extinction, camouflage, and even real world application of natural selection and evolution.

EVOLUTION CONCLUSION

- ▶ Darwin's observations have made a great impact in the scientific community. Because of his observations, we are better able to understand why some species survive and some die.
- ▶ We are also better able to take precautions to protect species that are endangered.
- ▶ Lastly, we can understand the diversity in the world around us and learn to appreciate it.



The objective of the activity is to recreate the peppered moth experiment, which took place in England during the Industrial Revolution. It demonstrates the importance of coloration in avoiding predation, relates environmental change to changes in organisms, and explains how natural selection causes populations to change.

If you need a lesson plan, chances are there are other teachers looking for the exact same thing; so the more requests, the better!

The virtual “Veterinarians’ Black Bag” program is designed to make it easy for you to make an exciting visit to your local school. We provide you with a set of presentation materials and suggested activities related to your practice that will interest K-12 students, and stimulate their interest in science.

We are not trying to directly recruit more veterinary students: The emphasis is on motivating students to learn more science and math, which is needed in preparation for science and various medical fields. We encourage you to focus on middle school (grades 5-8) because this is the time and place when most students become interested or lose interest in science and math. Our materials are geared for grades 5 to 9, but by scaling up or down you can make them work for

...the emphasis is on motivating students to learn more science and math, which is needed in preparation for science and various medical fields.

other grades. Please be careful to speak at a level students can understand.

Middle School Students:

- **Are still developing mentally.** Particularly, most do not process abstract concepts well. Anything you can do to make your statements more concrete (with metaphors, analogies, props, stories, etc.) will be helpful.
- **Will not know most of the medical terms you routinely use.** Reduce medical jargon as much as possible and explain those terms that must be used.
- **Have a much smaller vocabulary of ordinary English** than most adults. Words you assume they know may sail right over their heads.



Visiting veterinarian students work with teachers to develop presentations that supplement the teacher’s curriculum by addressing educational knowledge-based standards the teachers must cover each year. This benefits both the teacher and the students.

A Message for Veterinarians...continued

You don't have to make ideas too simple, but you do have to be diligent about presenting them in terms K-12 students can understand.

- **Have short attention spans.** You cannot lecture to them effectively for longer than ten minutes. Try to have several breaks for illustrations, questions, and discussion. PowerPoint slides are useful to teach biomedical content, but do try to take frequent breaks for interaction with students and for hands-on activities.
- **Enjoy effective hands-on activities** that illustrate the point. Any props or specimens that you can have them inspect will be a hit.



If live animals are brought into the classrooms, restraint strategies must be employed for even the most tolerant pets.

Other Items to Consider:

1. **Always make your arrangements through the teacher for the classes you will visit.** Many teachers will need to repeat the same class subject four or more times a day. We know you probably can't spend all day in a school visit. You will have to work this out as best you can with the teacher. The teacher might be able to combine classes so you can increase the numbers of students visited.
2. **It is important to make prior arrangements with the school** (teacher, time, place, duration of talk, number of talks expected) and to know the rules for class visits. Typically, you have to stop at the principal's office, explain why you are visiting, sign into the school, and get a pass of some sort. If things have been pre-arranged properly, the teacher may have arranged for someone, perhaps a student aide, to escort you to the classroom.
3. **Please consider potential hazards of items you bring to the school.** Do not bring sharp or very heavy objects that students might be handling. Even a placid dog can get unnerved around a lot of hyperactive and noisy students and may bite somebody. If you bring a dog or other pet to enhance the presentation, as in the case of the Physical Exam Module, make certain to muzzle the dog or take precautions for any animal the students might be handling.
4. **Look forward to the experience.** Working with young people can be fun and a source of new clients. The students will most likely treat you like a guest celebrity. They will tell their parents about your visit. If you are effective and interesting, praise for you and your clinic will spread throughout the school and community. You might even be asked to return!

If you are effective and interesting, praise for you and your clinic will spread throughout the school and community.

Over the next several pages, select Veterinarians' Black Bag lesson plans are showcased, including the physical exam, animal use in research, and the use of animals in preparation for human clinical trials.



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- Benefits to Veterinarians
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Veterinary Student Presentations:		PowerPoints
Canine Heartworms and Heartworm Disease	(16 minutes) view	download
Dental Health in Veterinary Medicine	(18 minutes) view	download
Diabetes Mellitus	(21 minutes) view	download
Genetics	(27 minutes) view	download
Orthopedics and Fractures	(12 minutes) view	download
Physical Exam	(22 minutes) view	download
Spaying and Neutering	(24 minutes) view	download
Vaccination	(16 minutes) view	download

Veterinarian Presentations:		PowerPoints
Animal Research	(21 minutes) view	download
Clinical Trials: Translational Medicine	(34 minutes) view	download
Modern Careers in Veterinary Medicine	(34 minutes) view	download
Neutering: Spaying and Castration see also Cat and Dog Populations	(11 minutes) view (7 minutes) view	download download
Vaccination	(28 minutes) view	download

Teacher Presentations:		PowerPoints
Bring the Vet School to YOUR school	(10 minutes) view	download

These online videos by Texas A&M University veterinary students and professors cover topics related to heartworms, dental health, diabetes, orthopedics, and animals in research offering middle school classrooms the opportunity to have a virtual veterinarian at the click of a button.

Objectives

1. Identify and classify the different types of microbes that cause infectious diseases and see how they interact with their host
2. See how those microbes depend on certain biotic and abiotic conditions to survive
3. Understand how drugs, treatments and medical devices are tested and evaluated for safety and effectiveness
4. Distinguish between different types of infectious diseases and understand ways to stop the spread of infectious agents
5. Look at symptoms of diseases, how the body reacts to the stimuli from infectious diseases
6. Model the transmission of infectious disease in a hands-on lab activity

Grade Level: 6th, 7th, 8th

Materials

- Plastic cups: one for every student (they can be washed and reused each period)
- Saturated baking soda solution
- Vinegar
- Distilled Water
- Phenolphthalein indicator or Boiled Cabbage indicator
- Infectious Disease PowerPoint
- Infectious Disease Spread Activity Sheet
- Infectious Disease Spread Activity Teacher Instructions
- Microbe Graphic Organizer
- Small syringes without needles (for extension)

Presentation Overview

Infectious diseases and their spread are a cause of national attention due to recent outbreaks. Infectious diseases are caused by many types of organisms and affect different systems of the body. Veterinarians and physicians need to know the causes of diseases and recognize their symptoms. The public can help stop the transmission of infectious diseases by following several easy steps.

This lesson begins with a veterinarian visit that will excite and engage students to learn about required scientific topics. This lesson is designed to capitalize on students' natural interest in animals to help motivate them to learn the required science curriculum.

Students investigate the spread of infectious diseases in a hands-on, safe way with cups of water to share (by pouring) as they visit person-to-person. One cup represents an "infected" student and contains a saturated baking soda solution. The "infected" student does not know that he/she is "infected." At the conclusion of the activity, the teacher tests the cups with a simple acid/base indicator. The "infected" students' water changes color.

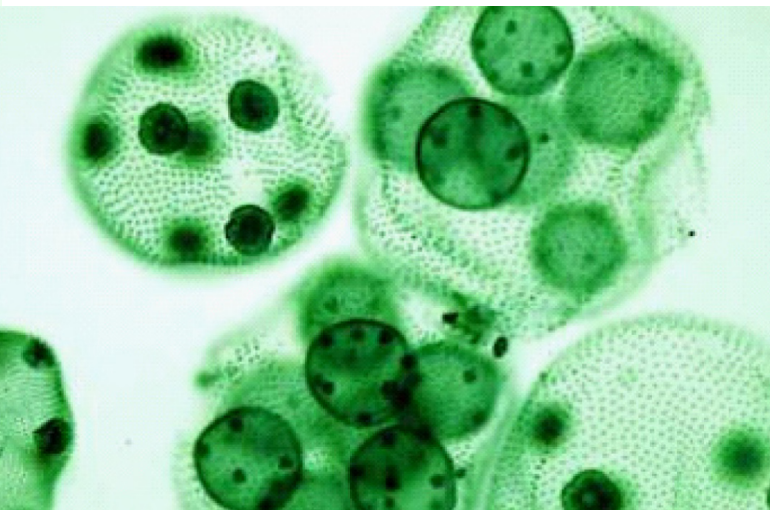
Demonstration

An Infectious Disease PowerPoint Presentation covers the main types of microbes and how they are classified. The presentation shows different types of diseases and specifies which microbes cause the disease. It also presents ways to prevent the spread of microbes.

Many "thinking" questions are posed and a few "Quick Checks" are provided with review questions to add several opportunities during the PowerPoint for student involvement. There are graphs included in the presentation and questions are asked to get students to interpret these and draw conclusions.

There is also a graphic organizer on microbes provided. This organizer is a five-part chart that is titled "Microbes." There is a section for each of five microbes. The students should label each section with the name of the microbe and then fill out information on the microbes like whether the microbe is unicellular or multicellular, eukaryotic or prokaryotic, autotrophic or heterotrophic, its Domain, and its Kingdom. The students may also draw one example of each microbe in its section.

An extension of the Infectious Disease Spread Activity could involve the students acting as mosquitoes. The mosquitoes are given instructions on how to "bite" students. Some of the mosquitoes are "infected" and some are not. A follow-up discussion comparing methods of disease transmission could be used to stimulate higher level thinking skills.



Instructions for Teacher

Infectious Disease Spread Activity

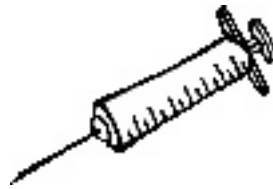
Where this Lesson can be used: Classification of organisms, response to stimuli, relationships between organisms, biotic and abiotic factors in ecosystems, using models in science.

Activity Instructions:

1. Each student will need a numbered cup. Fill all of the cups about half full with distilled water except for one. Mix a saturated solution of baking soda and water by adding baking soda to the water, then stirring or shaking vigorously. Repeat until no more baking soda will dissolve into the solution. Let this saturated solution stand until it is clear. This baking soda cup is the “infected” cup.
2. Give each student a cup. One student will receive the cup with the “infected” solution – you should know which one this is, but they should not.
3. Select which students are to be vaccinated and distinguish these students from the rest by giving them a sticker to wear. Explain to these students that the sticker represents a vaccination against a common infectious agent currently going around.
4. Tell all of the students that they will have three minutes to visit with other students. Each visit will include first, telling each other their names and second, sharing liquids. One of them will pour all of their liquid into the other’s cup. Then they pour half of the liquid from the filled cup back into the first cup.
5. Give them about three minutes to visit with up to five students.
6. At the end of three minutes, assemble the students in a line. Explain to them that, at the start of the exercise, all students except one had cups filled with water only. One student, however, had a cup filled with a saturated solution of baking soda. This cup represented the person who was infected.
7. Before determining which students are infected, have the students that were vaccinated step forward with their cups. Pour vinegar into the cups of these students representing the vaccination. Explain to the students that vaccinations only work if received prior to being exposed to an infectious agent but that, for the sake of this demonstration, the “vaccination” or vinegar solution had to be added at the end.
8. Now explain to all of the students (and show them) that you have an indicator solution, phenolphthalein. In an acid solution or a neutral solution, it is colorless. (Show students the bottle.) But in the presence of a base, it turns pink. You should test it ahead of time to determine the colors.
9. Go down the line and put a few drops of indicator into each student’s cup. If the student is “infected” (i.e. if the contents of his or her cup turn pink) have the student move to a designated part of the room.
10. Once everyone has been tested, write on the board the number of “infected” people.
11. See if the class can determine the originally infected person and then share with them who that was.

Lab Activity

Student Name: _____ Date: _____
 Teacher: _____ Period: _____



Spread of Infectious Diseases

1. Record the data:

Total Number of Students in class	Number of Students Infected at the Start	Number of Times Each Student Trades	Number of Vaccinated Students	Total Number of Students Now Infected

2. Name some examples of how diseases are spread in the real world. Explain how each example is similar and different to the model used in class.

Example:	
Similarities:	Differences:
Example:	
Similarities:	Differences:

3. List variables that may explain why your whole family does not get a cold every time you get a cold:

-
-
-

The Classification of Living Organisms Including Infectious Agents

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Basic Classification

Domains:

- There are three Domains of living organisms based on their characteristics:
- Archaea (also called Archaeobacteria)
- Eubacteria (also called Bacteria)
- Eukaryota (also called Eukarya)

Objectives

1. Learn how traits enhance a species ability to survive in its ecosystem
2. Distinguish the difference between inherited traits and learned behaviors
3. Learn how adaptations change over generations
4. Distinguish between adaptations and mutations
5. Understand each organism has a niche and the competition for resources
6. Learn of the risk of over population of a species and of the terms natural selection and selective breeding.
7. Learn about and tie in environmental factors that influence adaptations of organisms.

Grade Level: 6th, 7th, 8th

Materials (for 28 students)

- 7 scissors
- 7 plastic spoons
- 7 tweezers
- 7 large binder clips
- 4-5 boxes of large paper clips
- 200 large rubber bands
- 4-5 boxes of toothpicks
- 2 cups of macaroni
- 6 cups of various food items
- 28 plastic cups (best if clear)
- 28 worksheets
- Graph paper

Presentation Overview

This presentation discusses the traits and behaviors of animals and how veterinarians need to be especially observant of how an animal behaves. Animals have “body language” just as people do, and with animals that is the only way they have to communicate. Animal behavior can indicate fear, rage, sadness, happiness, and other emotions. Behavior may also indicate when an animal is sick, particularly if the behavior is not typical. Likewise, during the course of treatment, a sick animal’s behavior can indicate how well the treatment is working.

This lesson will engage students to learn about adaptations through their natural interest in animals as well as allow them to see the relevance in learning through real world application.

The first activity is in an 5E format – Engage, Explore, Explain, Elaborate, and Evaluate. This is the attention getting step. Because students are naturally interested in ani-

mals and their behavior, this presentation engages students by discussing the importance of understanding and recognizing animal behavior, as well as the training of behaviors. Students will see the necessity for knowing and understanding animal traits and behaviors to be a successful veterinarian.

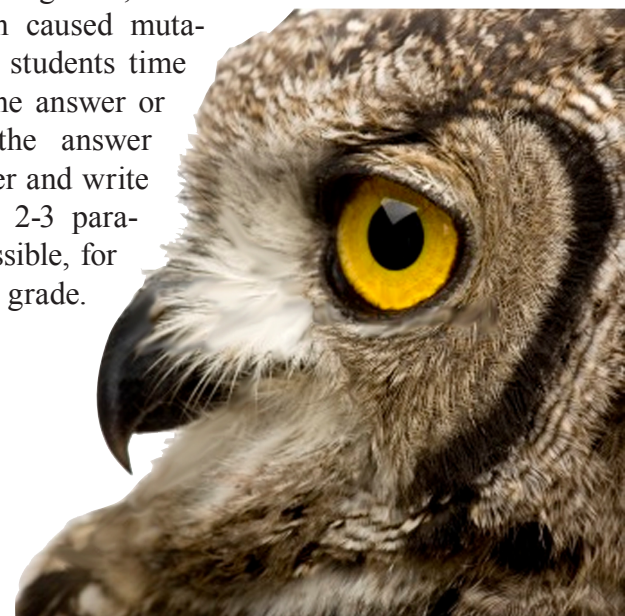
The next activity involves the whole class participating in a hands-on activity where they will represent different kinds of birds with different beaks designed to gather food in a different niche. This activity has students up and moving, competing for resources based on their specific bird beak adaptations. Students will learn to record data, create graphs and draw conclusions.

In the final activity, students are to choose 3 different organisms that all live in the same ecosystem. They then choose 3 traits per organism and compare them to each other, noting any similarities or differences that make the organism unique and successful in its niche and therefore able to survive with all the competition for resources within its ecosystem. Students are able to see the different types of traits that are passed on to different species that are designed to perform the same or similar task but in a very unique and special way. They will note the successful and beneficial traits that will be passed to future offspring.

Demonstration

Finally, there is a presentation on the necessary topics, which allows for many opportunities to hold class discussions, have group work moments, and even have a homework assignment on the subject. Teachers should preview this PowerPoint to be familiar with its flow and adjust slides to fit the needs of the class.

Lastly, teachers may use a question from one of the PowerPoint presentation slides as an additional assignment. An example might be, “how has Air Pollution caused mutations?” Give students time to look up the answer or brainstorm the answer with a partner and write well worded 2-3 paragraphs if possible, for an additional grade.



Activity Plan

Beak Business!

Activity Summary: This activity involves the entire class participating in a hands-on activity where they will represent different kinds of birds with different beaks designed to gather food in a different niche. This activity has students up and moving around, and competing for resources based on their specific bird beak adaptations. Students will learn to record data, create graphs and draw conclusions.

Activity Plan:

First Part:

1. Have students select a tool; spoon, tweezers, binder clip, or pair of scissors, and a plastic cup.
2. All students should stand or sit in a circle around a table or area where food will be dispersed.
3. Explain to them that they are now HUNGRY birds. They can only eat by picking up food with their selected tool, which represents their type of beak! The cup represents their stomach.
4. The cup must remain upright at all times and they must hold their beak in one hand and cup in the other hand at all times.
5. Explain to them that one type of food item will be spread out one at a time, in the middle of the circle evenly in all directions. When you say “GO” you will allow the birds to feed for 1-2 minutes and then say “STOP” or continue until all food is gone.
NOTE Depending on your students, you may need to monitor and caution behavior very closely as this activity can induce a very competitive and excited reaction amongst the students. Just as in nature!!! SAFETY MUST COME FIRST!!!! Anyone found injuring another bird or being aggressive with their beak should have to sit out. Those sitting out can observe and take notes on the birds’ behavior.
6. Once you have said “STOP,” have students count the items in their stomachs and record their data on the worksheet found at the end of this activity.
7. After students have recorded the number of food items they collected on their sheet, have them hand it back to you or place it to the side.
8. Tell them to prepare for the next type of food item. Spread out a different item and say “Go.” Allow students 1-2 minutes to collect food items. Follow the above steps until all birds have had an opportunity to try gathering all types of food items and have recorded their results.
9. CLASS DISCUSSION BREAK. Ask the following:
 - a. What did you notice about your ability to grasp the food items based on your beak?
 - b. Did everyone with your type of beak have your same difficulties or successes?
 - c. What did you notice about your behavior and the behavior of those around you?
10. Tally up the class totals for each of the beak types in a grid on the board. Have students create bar graphs that represent the class total for each of the beaks and food types. This can be started in class and finished as homework if necessary.

Second Part:

1. When all graphs have been completed, have students pick up their beaks and stomachs again and return to the feeding area. Tell them that normal ecosystems do not have just one type of food available at a time. Ask them “What will you do if all the food types are available?”

2. Spread out all of the food materials and allow 4 minutes for feeding. Again monitor student behavior for competitive and possible aggressive actions. Tell students they are not to cause injury or act inappropriately.
3. After 4 minutes is up or all the food is gone, have students collect and record data again on their worksheets indicating how many of each type of food they were able to gather.
4. Have students give you their food items when they are finished recording their data.
5. CLASS DISCUSSION BREAK. Ask the following:
 - a. What were your strategies this time in gathering food? If it was different than your previous times, how was it different?
 - b. Ask students which beak type would be most successful if all these types of birds flew to an island together and the only food there was the macaroni. Which bird beak would be most successful? Explain why.

Teacher Background Information: In any habitat, food is limited and the types of foods available may vary. Animals that are better adapted to take advantage of available foods will fare better than those who are less well adapted and, thus, live to pass on their genes to the next generation. While this concept seems rather obvious, it is essential that each student fully grasps its significance. Understanding the idea of adaptive advantage opens the door to understanding populations in ecosystems as well as the process of evolution.

What We Are Going To Learn:

- What are traits?
- Inherited vs. Learned
- Response to stimuli
- Evolutionary Adaptations
- Natural Selection and Selective Breeding



Within an Ecosystem:

Organisms that live together within an ecosystem are all competing for the same resources.



However, their specific adaptations allow them to be specialized in their niche and therefore reduce the competition for resources in some way.

Example:

Giraffes eat from tall trees instead of the shorter ones where all other animals eat.

Zebras eat from the top part of the grass

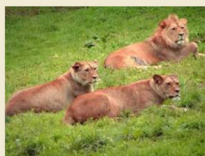
Wildebeest eats the leaves, **Gazelles** eat the rest of what's left.



Natural Selection:

These pictures show variation in species in big cats and owls.

Natural selection is considered to be the biggest factor resulting in the diversity of species (speciation).



What is Selective Breeding?

Angora Rabbits - bred for soft fluffy fur. Used in clothing.



Thoroughbred Horses - bred for speed!



- Breeders of animals and plants in today's world want to produce organisms that will possess the most desirable characteristics. What are desirable characteristics?
- So how do **you** think they make plants and animals with all the best characteristics??



Corn - new hybrids created to be high producing, drought resistant, and disease resistant.

Worksheet

Student Name: _____ Date: _____
Teacher: _____ Period: _____

Beak Business

First Part Data:

	Paper Clips	Macaroni	Rubber Bands	Toothpicks
Scissors				
Spoons				
Tweezers				
Binder Clips				

Second Part Data:

	Paper Clips	Macaroni	Rubber Bands	Toothpicks
Scissors				
Spoons				
Tweezers				
Binder Clips				

Objectives

1. Learn the real world application of the Scientific Method by studying the process of Clinical Trials
2. Understand how drugs, treatments and medical devices are tested and evaluated for safety and effectiveness
3. Ask well-defined questions, design an experiment, and use critical thinking to analyze research situations
4. Create a Mind Map graphic organizer for the Clinical Trial process
5. Explore the Clinical Trial process in an exciting Medopoly game

Grade Level: 6th, 7th, 8th

Materials

- Pre-Clinical Trials PowerPoint Presentation
- Clinical Trials PowerPoint Presentation
- Clinical Trials Activity Sheet
- Mind Mapping Instructions
- Mind Map Grading Rubric
- Clinical Trials Flyers Sheet
- Clinical Trials Process Tutorial
- Medopoly Game Materials:
- Medopoly Game Board PowerPoint (print from PowerPoint and assemble pieces)
 - Medopoly Instructions
 - Medopoly Clinical Deed Cards
 - Medopoly Community Meds Cards (print front to back)
 - Medopoly Chance Cards (print front to back)
 - Player tokens-any small items
 - Medopoly Money
 - Medopoly Phase Questions
 - Medopoly Phase Questions Answers
- Computer with access to internet or poster paper and markers for Mind Map Activity
- Current Magazine Advertisements for Pharmaceuticals- 6-8 depending on class size

Presentation Overview

Today, the concern about the safety of medicines, treatments, medical devices and vaccinations are on peoples' minds and in the news media. Clinical Trials are research studies to test drugs, procedures or devices to determine whether these are effective and safe. These studies are conducted with an eye to the future, in hopes of finding safer or more effective methods to screen for, prevent, diagnose, or

treat a variety of diseases. This process is a real world application of the Scientific Method and other scientific processes learned by so many students in school.

This lesson begins with a class discussion about fears that vaccinating children causes autism. Explain what autism is and that some parents believe that the mercury used as a preservative in vaccines is the cause of autism, even though only small amounts are used. Have the students discuss how drugs, procedures and medical devices are proven safe and effective.

The next portion of the presentation is an activity that provides students with the opportunity to view a clinical trials flyer and learn about its purpose and requirements for participation, and will determine students' interest in participating in a clinical trial. Have the students discuss the trial and what questions they would have for the clinic.

The next activity requires students to analyze and compare three sample clinical trials. They will write scientific questions for each of the sample trials and design an experiment for one of the sample trials. Through a series of questions, they will determine if they qualify for any of the sample trials and decide whether they would want to participate in the trial.

Then there is an exciting activity that requires the students to go through the stages of a Clinical Trial in a Monopoly board game format. There is a competition to see which person or team can get the required materials for a Clinical Trial and then conduct the trial by answering questions about the process.

Finally, the students get into groups and obtain magazine advertisements for pharmaceuticals. They must then identify a product and a product claim to design their own clinical trial to back up the claims of the drug.

Demonstration

Teachers will present a PowerPoint to inform the students about basic and applied research and about the steps of Pre-Clinical Trials. This presentation concludes with a summarization activity for the students. Students are given key words and asked to summarize the process of Pre-Clinical Trials. The students will then participate in an activity where they identify how the Clinical Trial process relates to the steps of the Scientific Method.

The PowerPoint presentation concludes with a Mind Map Activity for the students. Mind Mapping Instructions can be found in this lesson. There are several options for what topic can be mapped. The Mind Map can be of the materials presented in the PowerPoint or the materials in the Clinical Trials Process Tutorial, or it can be of a hypothetical clinical trial created by the students.

Activity Plan

Clinical Trials

Objective: You will evaluate and analyze several sample clinical trials. For each sample trial, you will need to determine what scientific question is being asked. You will need to design how the research for one trial could be conducted. You will also need to decide if you qualify and would be willing to participate in the sample clinical trials.

Procedure: Look at the following sample clinical research trials.

Sample Trial One:

Think You Might Have Dental Cavities?

RESEARCH PARTICIPANTS NEEDED

Center for Inflammatory Disorders

-and-

Center for Oral and Systemic Diseases

Male and female subjects with cavities are needed for a clinical research study. This study will assess the effect of gum chewing on dental health. Eligible subjects will receive certain treatments at reduced fees or no charge.

For information please call or e-mail the Center for Inflammatory Processes.

Sample Trial Two:

Lung Study

Do you live with somebody who smokes?

The Center of Environmental Medicine is looking for individuals for a clinical research study.

You will be reimbursed for completion of the study.

If you participate, you will have a breathing test, receive breathing treatments, and learn more about your lungs.

Discuss the following questions with your group and write your answers.

1. How are these sample trials alike?
2. How are these sample trials different?

What are Clinical Trials?

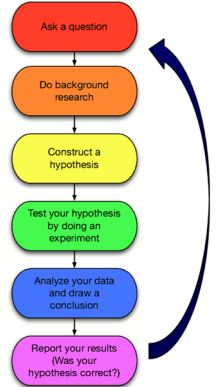
- Clinical Trials are medical or health-related research studies done in human beings (or in animals if the study is a veterinary study).



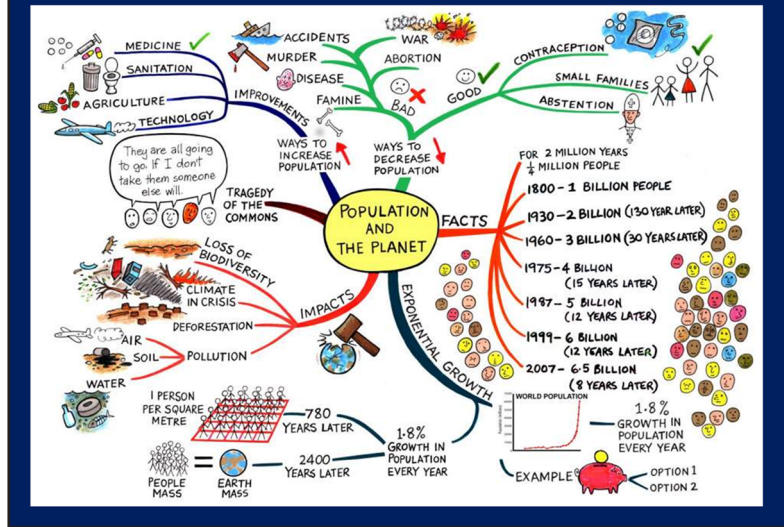
The Scientific Method

- Clinical Trials are “real world” applications of the Scientific Method.
- Each time a drug, medical device or procedure, is tested, a question is asked, a hypothesis is made, an experiment is conducted, results are analyzed, and a conclusion is reached.

The Scientific Method



Here is a Population Mind Map



Facts About Clinical Trials

1. Every research project has to be approved by an independent protocol review committee.
2. For research on humans, a human-subjects committee determines whether the research is justified and if subjects are fully informed about the procedures and their rights.
3. Researchers must obtain the full and informed consent of participating human subjects. If the patient is unable to consent for him/herself, consent may be sought from the legally authorized representative.
4. Subjects can stop participating at any time.
5. Responsibility for the safety of the human subjects is overseen by every stakeholder in the clinical trial process, including the sponsor, site investigator, Institutional Review Board, and regulatory agencies.

Objectives

1. Explore and understand the difference between temperature, heat and thermal energy
2. Compare the differences and similarities between heat, temperature and thermal energy
3. Explore how the human body maintains and regulates its internal body temperature and the systems involved with this
4. Explore how different species of animals have different characteristics to help them maintain their body temperatures
5. Explore and understand the importance of taking correct and accurate measurements when collecting temperatures

Grade Level: 6th, 7th, 8th

Materials

- A glass jar or bottle with a water-tight lid - the lid should be the screw-on kind and made from metal or plastic. The jar needs to be glass so that its shape does not change when you squeeze it.
- A drill or a hammer and a large nail
- Some silly putty, plumbers putty, caulk or chewing gum
- A drinking straw - 8 or 10 inches (about 23 cm) long, the thinner the better, preferably clear
- Some food coloring (not required)
- Temperature PowerPoint presentation

Presentation Overview

When a veterinarian or physician sees a patient, their first action is to determine “what’s wrong”. This is when questions are asked and observations are made. One of the observations made is body temperature of the patient. All observations are collected and used to determine if organs and systems are functioning properly or if further tests are necessary. The physician will analyze all the data to make inferences, testable hypotheses, plan specific diagnostic tests and finally draw valid conclusions on a diagnosis.

The lesson begins with a Comic Strip Activity which involves students filling in the words for the pictures they see or vice versa, drawing pictures for the description given, all in a comic strip format. Some students may choose to create both their own drawings and descriptions.

The next activity is the Make Your Own Thermometer Activity. Have students hypothesize on how accurate their

thermometer will be compared to others. Once the thermometers are made, students can use their thermometer to take the temperature of various containers holding water of different temperatures and then compare their homemade thermometer readings to a regular bulb thermometer, a digital thermometer and then to the accuracy of temperature probes if the school has them. Students will summarize and conclude their results on the accuracy of their readings with the various thermometers.

The students can then do the Body Temperature Activity as a homework assignment. This activity addresses homeostasis, equilibrium, negative feedback and the interaction of systems. Students should be sure to reference the body systems involved and the negative feedback mechanisms at work to maintain stable internal temperatures.

Additional steps include the students researching warm-blooded organisms vs. cold-blooded organisms or creating data tables showing the temperature and time variables from an activity using different water temperatures and the dissolving of food coloring.

Demonstration

This lesson is introduced via an engaging step where a presentation is given by a veterinarian, through a video link to the presentation, or by a teacher’s review of the presentation with the class.

Teachers are encouraged to stop periodically throughout the PowerPoint and discuss questions on slides before presenting the slide with answers. Students can work in pairs when answering questions and can use a 3 column note strategy to keep concepts such as temperature, heat, and thermal energy clear in their notes. This can also be used for concepts such as conduction, convection and radiation. Teachers can then use Triple Venn Diagrams to compare/contrast conduction, convection, radiation as well as temperature, heat and thermal energy.



Activity Plan

How to Make a Home-Made Thermometer

To make your thermometer:

1. Drill or punch a hole in the lid of your jar. The hole should be as close to the diameter of the straw as you can get.
2. Insert the end of the straw into the hole, and then seal around the hole with your silly putty both on the inside and the outside of the lid.

When complete, it should look something like this:

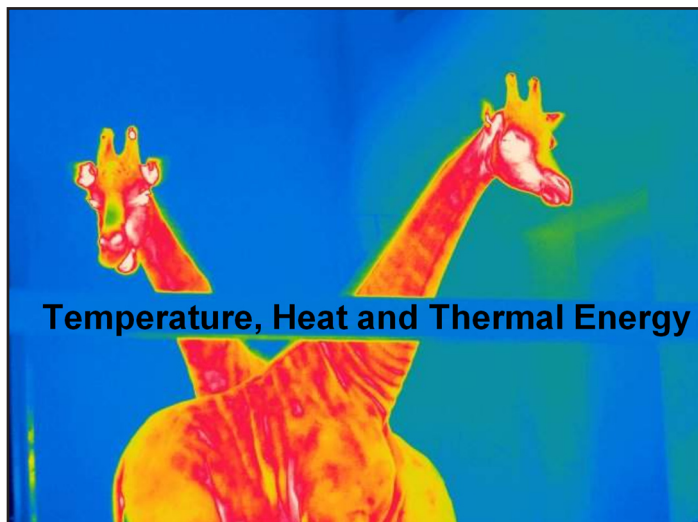


3. Fill your jar with cold water. You can do this either by filling it with water and leaving it in the refrigerator overnight, or by making some ice water in a pitcher and then pouring the ice water into your jar (straining the ice out in the process -- all you want is water in the jar). Add food coloring if you desire and shake it up.

Put the jar on the table to keep it steady -- you want the jar filled to the brim with cold water, as full as you can get it without overflowing.

4. Put the lid on the jar as shown in the figure above. When you screw on the cap, a little water may spill out the sides, and a little water may be visible in the straw. That's okay.

5. Place the jar in your kitchen sink, plug the sink and run hot water into the sink until the sink is about half full. Watch the level of the liquid in the straw and a very unusual thing will happen: You will SEE the water in the jar expanding right before your eyes! As the water in the jar gets warmer, it will expand and rise up the straw. This sort of expansion happens every day, but we don't really notice it because the amount of expansion is fairly small. Here, because we have routed the expanding water into a narrow straw, it is much more obvious. We can actually see it happening.

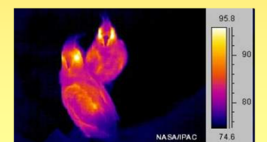


What does it mean to be warm-blooded?

- Warm-blooded creatures, like mammals and birds, try to keep the inside of their bodies at a constant temperature.
- They do this by generating their own heat when they are in a cooler environment, and by cooling themselves when they are in a hotter environment.
- To generate heat, warm-blooded animals convert the food that they eat into energy.
- They have to eat a lot of food, compared with cold-blooded animals, to maintain a constant body temperature.
- Only a small amount of the food that a warm-blooded animal eats is converted into body mass. The rest is used to fuel a constant body temperature.



Thermal imaging of boy above.



Thermal imaging of birds above.

Objectives

1. Learn why animals are used in scientific research and education
2. Learn what people have discovered from animal research by seeing the contributions of scientists who study animals and what different species of animals have been used in important research studies
3. Understand that there are laws that govern how laboratory animals are used and cared for
4. Research the controversy surrounding the use of animals in research and write a persuasive paper on animal usage
5. Explore how different species of animals have different characteristics to help them maintain their body temperatures
6. Analyze information about using animals in research and debate the pros and cons of animal research

Grade Level: 6th, 7th, 8th

Materials

- Animals in Research PowerPoint Presentation
- Animal Research Writing Activity
- Access to Computers with Internet (or copies of articles from the suggested websites in the activity)

Presentation Overview

People who favor the use of animals in scientific research cite the many benefits. Among those are many drugs, vaccines, treatments, medical devices and procedures that have been discovered that have paved the way for better health in human beings. The results from this research have also improved the health and quality of life for animals in the field of veterinary medicine. On the other hand, those who oppose the use of any animals in research are concerned that laboratory animals are exposed to too much suffering and that there are better alternatives than using animal in research.

One activity is the Animal Research Student Survey where students should fill out their answers honestly. The questions are meant to make the students think about the topic to be presented. Some students feel very strongly about this issue, so encourage the students to quietly fill out the survey so that they do not influence their peers.

The next activity involves students reading a children's story and brainstorming a list of animals that do work of some kind. Conduct a short discussion about how different animals do work in their own habitats and in human settings.

The writing activity involves students writing a letter to the editor of a local newspaper expressing their views on using animals in research. Ask them to research the pros and cons of using animals in research through various websites. If computers with internet are not available, the teacher may wish to copy selected articles from websites to use in the classroom.

And finally, teachers have students divide into groups. One group should be for using animals in research and the other should be against using animals in research. Students then conduct a debate over the topic. When debating, students should remember that everyone must participate, so each person should have an opportunity to speak. Also, students should be courteous and respectful to each other. The Animal Research Survey could be given again at this point and results from the pre-debate opinions can be compared to the results from the post-debate opinions.

Demonstration

Teachers present the role of animal research in human and animal health advances. Using animals for scientific research evokes strong emotions among those on both sides of the issue. The presentation begins with asking students what research is and how we use animals in research. Teachers are encouraged to share from their own experiences if they have used animals in research or education (like all of those animals used in veterinary school!). Teachers should help students understand why the use of animals is so important and requires a great deal of responsibility.



Writing Activity

Animal Research: Pro or Con?

1. You are going to research the pros and cons of using animals in scientific research. You need to research these basic questions about animal research before you begin to write:
What are the benefits of using animals in research? (Pros)
What are the detriments to using animals in research? (Cons)
2. Now, you are going to choose whether you are FOR using animals in research or AGAINST using animals in research.
3. Write an editorial to your local newspaper explaining your view. You will need to reinforce your opinion with facts that you learned from your research. Your focus will be to persuade others to believe the same way you believe. Make sure to state: what your belief is, why you feel that way, what the facts are that back up your belief, and why your audience (the readers of the paper) should believe the same way.
4. Your paper will be graded according to the Persuasive Writing Scoring Guide. Make sure you read over this guide before writing your paper.

Why Do We Need To Use Animals for Research & Teaching?

- Animal are used to:
 - Understand how diseases affect living tissue
 - Develop and test treatments — including treatments for animals
 - Train future scientists and health-care professionals



Animal Use in Biomedical Research

- Stroke
 - Stroke kills over 150,000 people in the U.S. each year and cause major disabilities that can include paralysis, inability to speak, loss of vision and loss of cognitive function.
 - A new treatment for stroke (and one that can reverse disability due to stroke), was first studied in rats.



Facts About Animal Research

1. Pain experienced by research animals is minimized or eliminated in most experiments, unless pain-killing drugs interfere with the experiment.
2. Most animals used in research are purpose-bred for research and are not purchased from animal shelters and are not lost or stolen pets.
3. The Animal Welfare Act requires that all research institutions have an Institutional Animal Care and Use Committee (IACUC). The purpose of the committee is to oversee care of all animals used in teaching and research and to evaluate all research projects and ensure that animals will be treated humanely and that pain and distress will be minimized as much as possible, according to USDA standards.
4. The competition for research grants deters animal research that is not essential.
5. Without knowledge gained from animal research, millions of humans and animals would be dead or living with a reduced quality of life.

The National Center for Research Resources

The National Center for Research Resources (NCRR), one of 27 institutes and centers that make up the National Institutes of Health, provides laboratory scientists and clinical researchers with the training and tools they need to better understand, detect, treat, and prevent a wide range of diseases. With this support, scientists make biomedical discoveries, translate these findings to animal-based studies, and then apply them to patient-oriented research. Ultimately, these advances result in cures and treatments for common and rare diseases.



One of NCRR's four divisions—**Comparative Medicine**—develops and provides access to animal models that offer essential clues to human disorders, such as AIDS, Parkinson's disease, and multiple sclerosis, and serves as a valuable resource to the research community. NCRR supports resources that provide access to a broad range of nonhuman models, including primates, rodents, zebrafish, worms, and cellular models. The center also trains veterinarians in translational research to enhance the country's ability to respond to the emergence and spread of potentially deadly human diseases, such as influenza and hepatitis. For more information, visit www.ncrr.nih.gov/cm.



Another part of NCRR—the Division for **Clinical Research Resources**—supports the Clinical and Translational Science Award program. As part of a national consortium made up of academic health centers located across the country, CTSA researchers are working to re-



An overview of two NCRR programs:

1. The Viper Resource Center (VRC) is a program of the Natural Toxins Research Center at Texas A&M University-Kingsville. VRC provides the research resources, facilities, and training that will lead to the discovery of medically important toxins found in venoms. Currently, VRC's primary research focus is the characterization of disintegrins, molecules found in snake venom that have potentially important applications in the discovery of new drugs for the treatment of cancer, heart attacks, and stroke. Beyond this, VRC shares its re-



search in a snake and venom database accessible to investigators worldwide. For more information, visit www.ncrr.nih.gov/cm/viper.

2. NCRR oversees a network of eight National Primate Research Centers (NPRCs). These highly specialized facilities develop animal models, such as monkeys and baboons, facilitating research into diseases including HIV/AIDS, hepatitis, and cancer. Together, these centers have more than 26,000 animals representing more than 20 species of nonhuman primates, mostly macaques. Visit www.ncrr.nih.gov/primate_centers to learn more.



duce the time it takes for laboratory discoveries to become treatments for patients. This research includes developing better designs for clinical trials to ensure that patients with rare as well as common diseases benefit from new medical therapies. The consortium is also fulfilling the critical need to train the next generation of clinical and translational researchers. For more information, visit www.ctsaweb.org.

Other parts of NCRR support **Biomedical Technology Research Resources**, which develop

The National Center for Research Resources...continued

versatile new technologies and methods that help researchers studying virtually every human disease. The Biomedical Informatics Research Network, for example, provides researchers with a searchable database combining regulatory data, animal metadata, imaging data, and analysis in a uniform, Web-accessible format. Visit www.ncrr.nih.gov/bt. Still another division of NCRR—**Research Infrastructure**—provides research opportunities for junior investigators, enhances the caliber of scientific faculty, and increases the number of competitive investigators from minority and underserved communities.

An integral part of NCRR's mission is science education and health literacy. To encourage an early interest in science, NCRR's **Science Education Partner-**


ship Awards provide funding to schools, science museums, and community organizations for projects that increase scientific literacy, create innovative educational opportunities, and expose the nation's youth to the excitement of science. These efforts not only raise public awareness, but ultimately contribute to the development of a future generation of scientists and researchers. For more information, visit www.ncrrsepa.org.

To inform the public of its research efforts, NCRR offers an informative Web site (www.ncrr.nih.gov), publishes a free quarterly newsletter (in print and online at www.ncrr.nih.gov/publications), and provides news about recent research advances.

Veterinarians' Black Bag: Current and Coming Attractions!

Shown below are some of the current and coming Veterinarians' Black Bag curriculum units. Each curriculum unit includes a PowerPoint presentation, a presentation plan, and a collection of follow-up classroom activities. All current and coming curriculum units may be found at <http://peer.tamu.edu/vbb/summary.asp>.

Neutering



SPAYING and CASTRATION
a veterinary visit to middle schools presentation guide

The slide features two illustrations of veterinarians: one with a cat and one with a dog. The text is centered in a dark purple box.

Why neuter animals?

- Advantages of neutering
 - Diseases prevented in animals
 - Behavioral benefits to neutering
 - Preventing over-population
- Animal shelter statistics
 - Number of animals in local animal shelter
 - Number of animals euthanized versus adopted in U.S.
 - Role of neutering in reducing animal shelter burden

U.S. Pet Statistics

- An estimated **52 million dogs and 57 million cats** live with U.S. families.
- For every human born, **7 puppies and kittens** are born.
- **More than 12 million dogs and cats** are euthanized in shelters each year. **Millions more** are abandoned in rural and urban areas.

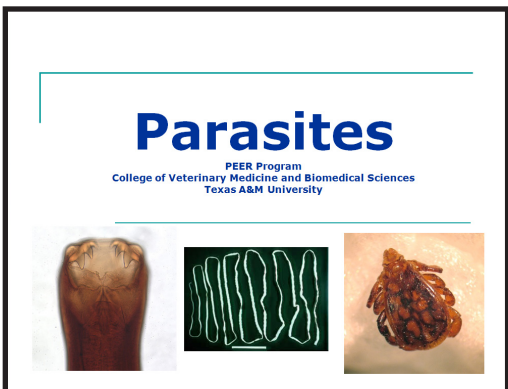
<http://www.animalworldnetwork.com/bsurpetstat.html>

The slide includes a map of the United States with a red outline.

Parasites

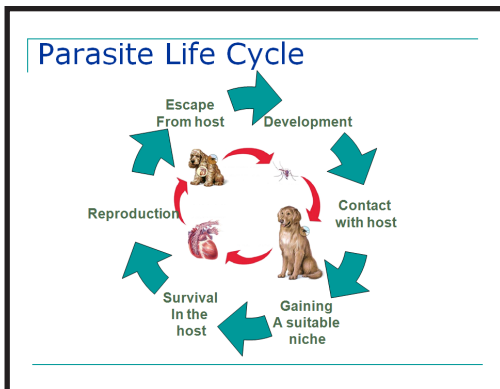
Parasites

PEER Program
College of Veterinary Medicine and Biomedical Sciences
Texas A&M University



Three images showing different types of parasites: a tick, a nematode, and a flea.

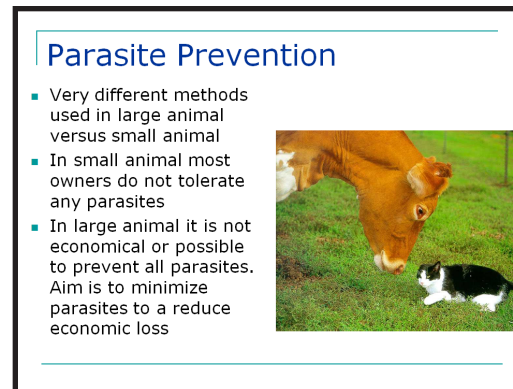
Parasite Life Cycle



A circular diagram showing the stages of a parasite's life cycle: Contact with host, Gaining A suitable niche, Survival In the host, Reproduction, Escape From host, and Development.

Parasite Prevention

- Very different methods used in large animal versus small animal
- In small animal most owners do not tolerate any parasites
- In large animal it is not economical or possible to prevent all parasites. Aim is to minimize parasites to a reduce economic loss



A photograph of a brown cow and a black and white dog grazing in a field.

Animal Behavior



Animal Behavior


Solitary Lives:

- Why do some animals live solitary lives?
 - Some animals live alone because there are not enough resources to support more than one animal in the territory (i.e. food, shelter, etc)



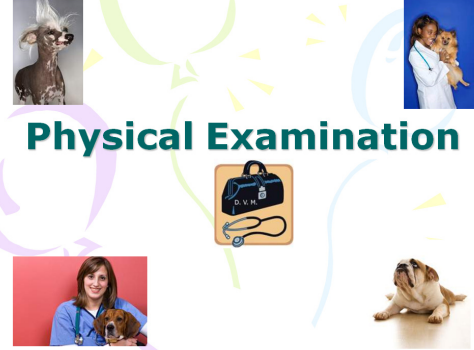
How Did Animals Get These Behaviors?

- Genotype - Inherited Traits:** These behaviors are part of the animals genetic makeup and are due the evolution of the packs overtime.
- Learned Behaviors:** The animals learn from certain experiences they have had and this can shape how they act when presented with that experience again.
- Present Environment:** The animals must adapt to whatever environment they are currently in, in order to survive.



Physical Exams


Physical Examination




Next, the veterinarian may take the animal's temperature.

Normals

- Cat**
 - Resp: 16-40 bpm
 - Temp: 101.5°F
 - HR: 120-140 bpm
- Dog**
 - Resp: 18-34 bpm
 - Temp: 102.5°F
 - HR: 70-120 bpm
- Pig**
 - Resp: 32-58 bpm
 - Temp: 102.5°F
 - HR: 70-120 bpm
- Horse**
 - Resp: 10-14 bpm
 - Temp: 99-100°F
 - males lower
 - HR: 28-40 bpm
- Cow**
 - Resp: 26-50 bpm
 - Temp: 101-101.5°F
 - HR: 48-84 bpm
- Sheep/goat**
 - Resp: 16-34 bpm
 - Temp: 102.3°F
 - HR: 70-80 bpm



Heart Disease

Heart Disease


An introduction to problems that can occur in the heart

Partnership for Environmental Education and Rural Health
Texas A&M University
<http://peer.tamu.edu>

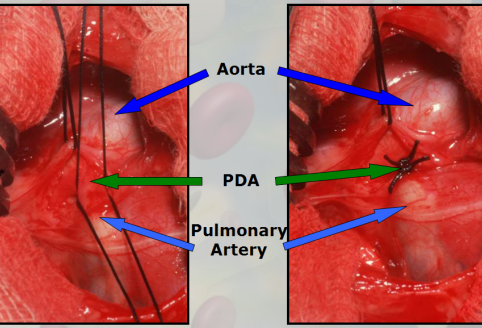
The Heart as a Pump

- The heart works as a pump, forcing blood forward into the arteries.
- Blood returns to the heart in veins. Veins have valves.
- Question: What is the function of the valves?

Hint: in the diagram, look at the direction of blood flow and how the valves close



Surgical Ligation



Aorta
PDA
Pulmonary Artery

Animals in Research

Animals in Research



What is research?

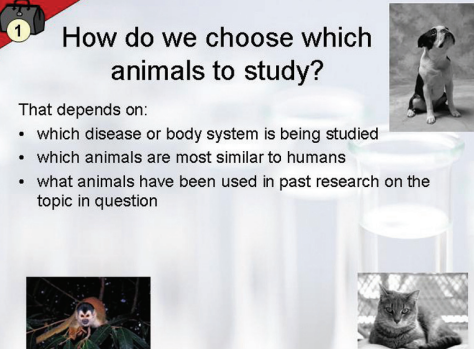
Scholarly or scientific investigation or inquiry



How do we choose which animals to study?

That depends on:

- which disease or body system is being studied
- which animals are most similar to humans
- what animals have been used in past research on the topic in question





“Accomplishments of veterinary medicine and biomedical science will soon be in the hands of today’s youth. Science promotion through partnerships between local veterinarians and public education should enhance the number of underrepresented youth that enter and remain in science academic tracks, and better prepare them to meet the nation’s needed scientific and biomedical workforce. We hope the Veterinarians’ Black Bag Model will facilitate these veterinary and science partnerships”

- Larry Johnson, Ph. D.

Partnership For Environmental Education and Rural Health (PEER)



Science Resources for the Middle School Classroom

[Home](#) | [Teacher Resources](#) | [Request a Lesson Plan](#) | [Teacher Workshops](#) | [Videos](#) | [NSF GK-12 Program](#) | [For Veterinarians](#)

The PEER website offers resources for Middle School Teachers:

- Free curricular modules integrating environmental health science into science, mathematics, social studies, and English classes.
- Web-based curricula directed toward the promotion of middle school life science education.
- A collection of resources created at the request of middle school teachers from around the nation.
- Teacher Workshops to provide technology instruction and strategies for integrating curricula.
- Free virtual scientist presentations and interviews to download and share.
- Links to other curriculum and instructional resources.

Visit <http://peer.tamu.edu> to take advantage of these resources!