Trueman
Equine and Comparative Orthopedic Research
Annual Report

December 2005-December 2006
Preface

It is my pleasure to present our fifth annual report for 2006 from the Trueman Equine and Comparative Orthopedic Research Program. In our initiation year [2002], we established the groundwork for the activities that have come to fruition in these subsequent reports. Our continued use of the research suite (room 325) in the Veterinary Medical Academic Building and the Gait Analysis and Applied Research Laboratory (Room 1338 Veterinary Hospital) has been integral to the success of our funding and research projects. Our biggest accomplishments in the year 2006 have been the implementation of the commercialization of the Equine GeneChip® (U.S. Utility Patent Pending) through a Memorandum of Understanding with the Microarray Core Laboratory in the Dorothy Davis Heart and Lung Research Institute at The Ohio State University, the successful completion of a PhD degree by Dr. Terri A. Zachos, DVM, Diplomate ACVS, Ruth L. Kirschstein NIH/NIAMS NRSA Fellow for her dissertation entitled “Gene-augmented mesenchymal stem cells in bone repair”, and the funding of an NIH R01 contract with the University of Washington to study the engraftment of mesenchymal stem cells in bone.

We also continue in the active projects of an award from the Grayson Jockey Club Foundation for our work on “Molecular therapy for bone healing in horses” including a PhD stipend for Dr. Akikazu Ishihara, as well as a grant for a study with Pfizer Global Research and Development using our patented “isolated equine joint model” to study the pharmacodynamics of new lead candidate small molecule therapies for natural occurring osteoarthritis and Dr. Bertone’s KO8 award to study gene therapy of cartilage healing. In continuing our interdisciplinary and comparative mission, we have continued our interactions with the Department of Orthopedics, in collaboration with the College of Medicine and Public Health, using human cell lines and incorporating orthopaedic residents in our scientific training program. We have maintained our Bio-safety Level II laboratory status and approved portions of the veterinary hospital for gene therapy of horses, both research and clinical cases. We have applied autologous biologic protein and stem cell therapy in 3 equine clinical cases in our hospital.

Our research progress is continuing and we have submitted 5 competitive research grants new in 2006, 4 extramural and 1 intramural. These studies, if funded, will serve to support a graduate degree for 2 equine surgery residents and a PhD student. Additionally, we have submitted for a research contract to study a biodegradable bone cement to augment implants in healing equine bone and received a “gift in kind” for materials for our autologous biologic therapy project. Both of these proposals support degree theses for equine surgery residents in training. In both of these studies, horses and humans will directly benefit from the work. Additionally, our original scientific work was presented at 1 international (European College of Veterinary Surgery), 3 national/international (Orthopaedic Research Society, American Society for Gene Therapy, and the American College of Veterinary Surgery) and 2 local meetings (Advances in Research Forum at the CVM and the Hayes Research Forum) in 2006. Much of our work contained in the Final Report from 2005 was published in 2006, with a banner year for both number of peer reviewed scientific publications and the quality of scientific publications based on achieving the highest impact factors since the inception of the lab. In 2006 alone, we published 8 original scientific papers, 1 in the top clinical orthopedic journal, 1 in the top orthopaedic research journal, 1 in the top surgery journal, and 3 in the top veterinary research journal. Our 2006 manuscripts included novel clinical reports as well as basic science reports and translational reports using our genetically engineered cells to promote bone repair. Specifically, a study evaluating the effect of low verses high molecular weight hyaluronic acid (a common arthritis medication for horses and humans) on gene expression of equine synovial cells using the...
Equine GeneChip was accepted for publication in Arthritis Research and Therapy with electronic distribution of our data, and our gene expression profile of naturally occurring osteoarthritis in horses was published in the top veterinary research journal, AJVR. We have also disseminated our new genes on the equine gene chip into a public database. Other active scientific research projects in the laboratory currently include (1) the modification of our gene plasmids for their incorporation into modified adeno-associated viral vectors to provide expanded tropism to articular cells for gene therapy, (2) managing the marketing of the equine GeneChip® to equine scientists around the world to distribute this scientific tool while obtaining intellectual property royalties for OSU, (3) the study of mesenchymal stem cells to deliver genes to heal articular fractures in horses, and (4) the investigation of signaling in and use of siRNA knockdown of IL-1 beta in osteoarthritis. We are just initiating our studies to enhance engraftment of stem cells into bone to potentially cure inherited bone diseases by gene targeting or corrected genes. Our research continues to bridge the gap from molecular biology to clinical application to continue our goal of providing cutting edge translational research in the biomedical field to better the health and welfare of the animals and humans.

In addition to doing the research, we have continued to disseminate the information at national and international equine scientific meetings, orthopedic research meetings, and gene therapy meetings. This year (2006) we are honored by a selection for presentations at the 2007 Orthopedic Research Society meeting as well as European and American Veterinary Surgery Symposia. These international meetings recognize all research worldwide in all musculoskeletal programs. Eight scientific manuscripts of our work have been published or accepted for publication in 2006; 3 others are under consideration for publication. We have relayed our work to horse owners through publications and news articles in lay journals including The Horse, Thoroughbred Times, and Paint Horse Journal.

We look forward to the future with great enthusiasm. We anticipate exciting discoveries and benefits on orthopedic conditions in horses that will ultimately extend to people with similar conditions.

Alicia L Bertone, DVM, PhD, Diplomate American College of Veterinary Surgeons
Trueman Family Endowed Chair
Professor, Equine Orthopedic Surgery
The Ohio State University
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Mission

Our mission is to investigate musculoskeletal biology and molecular medicine therapies that are associated with orthopedic disease conditions in horses and humans. Under this umbrella, we will study gene therapy systems and tissue engineering, as well as utilize a comparative approach in our research. We are dedicated to the efforts that are necessary for translational research which moves from “bench to bedside”. We will focus on conditions and therapies that are designed to be directly beneficial to our patients.

Our five main research focuses are:

1. Enhancement of articular cartilage healing with emphasis on the cartilage/bone interface
2. Acceleration of bone repair
3. Identification of genetic markers of orthopedic disease
4. Physiology and pharmacology of medications for joint disease
5. Optimizing gene therapy protocols for use in patients with orthopedic disease

2005-2006 Supporters of our Program

Trueman Family
Pfizer, Inc.
Equine Research Council, OSU
Affymetrix, Inc.
Bone Solutions, Inc.
Dr. Bertone received her Bachelor of Science degree (1977), DVM degree (1982) and internship (1983) from Cornell University, subsequently completed a combined surgery residency/PhD program (1987) at Colorado State University and joined the surgery faculty at Louisiana State University that same year. Dr. Bertone became board certified as a Diplomate in the American College of Veterinary Surgeons in 1988 and joined the surgery faculty at The Ohio State University late in 1989. Dr. Bertone focused her clinical and research efforts in the field of orthopedics and became a full professor in 1997. Dr. Bertone has mentored many PhD and Masters of Science graduate students, surgery residents and research fellows and has developed a reputation for a quality and productive research program. In 1999, Dr. Bertone was recognized as one of the top extramurally funded researchers in the College of Veterinary Medicine and had greater than 100 peer reviewed scientific publications. After completing a 1-year sabbatical at the Center for Molecular Orthopedics at Harvard University (2000), Dr. Bertone was appointed to the Trueman Family Endowed Chair (2001) and established the Comparative Orthopedic Molecular Medicine Suite and Applied Laboratories. Dr. Bertone is a member of the Veterinary BioSciences graduate program and an adjunct full professor in the Department of Orthopedics in the College of Medicine and Public Health. Dr. Bertone was elected a member of The Dorothy M. Davis Heart and Lung Research Institute in 2002. Her research focus is in the study of comparative orthopedic medicine and gene therapy for the treatment of cartilage injury and bone repair. Dr. Bertone has been active in veterinary and human orthopedic associations and has been regularly invited to participate in national and international scientific meetings for her expertise in orthopedics and orthopedic research.

Dr. Yvonne A. Elce is a Clinical Assistant Professor with a special interest in Orthopedic Surgery at The Ohio State University College of Veterinary Medicine. Dr Elce completed her veterinary degree at the Ontario Veterinary College in 1997 (DVM 1997) and a large animal internship at Washington State University in 1998. Dr Elce received advanced training in equine surgery in the surgical residency program at New Bolton Center at the University of Pennsylvania from 1999-2001 and became a Diplomate of the American College of Veterinary Surgeons in 2002. Dr Elce was employed for 3 years at New Bolton Center as a clinical instructor in equine surgery, and 2 years at North Carolina State University as an assistant professor in equine surgery before joining our team at The Ohio State University in December of 2006. Dr Elce's research interests have included studies in cartilage resulting in several presentations at national meetings. Her work on a novel external fixator for distal radius fractures was published in Veterinary Comparative Orthopaedics and Traumatology in 2006 and presented at international meetings. Dr Elce also contributed to retrospective clinical studies reporting on standing arthroscopy and hock fractures in Standardbred racehorses which were published in Veterinary Surgery and the American Association of Equine Practitioners Proceeedings and presented at international meetings. Currently her research interests include optimizing equine fracture repair and she is excited to be joining the vibrant orthopedic research team at OSU. Clinically her work is mainly in specialized orthopedics with Dr Bertone.
Dr. Zachos is a small animal orthopaedic surgeon and a Diplomate of the American College of Veterinary Surgeons (ACVS), receiving board certification in 2002. Her clinical interests involve a subspecialty focus on orthopaedic traumatology, including management of complex articular fractures, with a special interest in delayed and non-unions, as well as minimally invasive approaches to fracture healing and joint injury and disease, and biologic approaches to surgical management of orthopedic trauma. Her research interests include bone morphogenetic protein (BMP) gene delivery for healing of articular fractures and osteochondral defects using biologic three-dimensional matrices, molecular imaging techniques, and microarray analysis in orthopedic disease, injury and repair. All of these are techniques developed in the Comparative Orthopedic Molecular Medicine Suite and Applied Research Laboratories at The Ohio State University. In our laboratory, Drs. Zachos and Bertone have developed an in vivo model of augmentation of articular fracture healing in the rat using gene delivery to bone marrow-derived mesenchymal stem cells in various delivery systems, utilizing serial documentation of gene expression in live rats with an in vivo imaging system and an adenoviral-luciferase reporter gene construct. These studies resulted from Dr. Zachos’ in vitro work in our laboratory defining the osteogenic differentiation potential of rat, mouse, and equine mesenchymal stem cells, a three-dimensional culture system appropriate for in vivo implantation, and transduction characteristics of mesenchymal stem cells of bone marrow origin in multiple species. Dr. Zachos is funded by a Ruth L. Kirschstein Individual National Research Service Award from the National Institutes of Health/National Institute of Arthritis and Musculoskeletal and Skin Diseases. She presented her scientific work at the 2005, 2006, and 2007 meeting of the Orthopedic Research Society. Dr. Zachos has several publications emanating from her PhD Degree. An invited review on the use of growth factors in orthopedics, authored by Dr. Zachos and co-authored by Dr. Bertone, was published in the April 2005 issue of the American Journal of Veterinary Research. A publication documenting the results of Dr. Zachos’ in vitro studies on gene delivery to mesenchymal stem cells was published in the Journal of Orthopaedic Research in 2006 and a publication detailing our novel rodent model of articular fracture healing has been accepted in the Journal of Investigative Surgery in 2006. Two other manuscripts are in review. Dr. Zachos successfully completed her PhD degree from our program in June 2006 and accepted a position as an Assistant Professor of Orthopedic Surgery, tenure track, at Michigan State University.

Spencer Smith joined Dr. Bertone’s research program in September of 2006 as a research assistant for the Comparative Orthopedic Molecular Medicine Suite and Applied Laboratories. Mr. Smith graduated from the Ohio State University in 2004 with a Bachelor’s Degree in Biology. Mr. Smith has considerable research experience in cell culture, biochemistry, and molecular biology. He has worked the last three years with Dr. Samson Jacob in the department of Molecular and Cellular Biochemistry in the college of Medicine studying methylation and its relation to cancer. Mr. Smith’s responsibilities include project management for our contract research, which comprises animal care, data acquisition, data analysis, and report preparation. His also manages the Comparative Orthopedic Molecular Medicine Suite and Applied Laboratories.
Dr. Kelly Santangelo, a Trueman PhD graduate student, joined the lab in 2004 after receiving her DVM degree from the College of Veterinary Medicine at Cornell University. The first year of her program was spent taking courses in molecular biology and completing a project that compared the ability of several intra-articular joint supplements to protect equine synovial cells in culture against lipopolysaccharide (LPS) induced inflammation. This project evaluated the clinical application of these products through gene expression profiles using the Affymetrix Equine Gene Chip. This manuscript is accepted for publication in Arthritis, Research and Therapy. Dr. Santangelo’s thesis project will focus on determining the role of interleukin-1b mediated signaling in the progression of spontaneous osteoarthritis in an animal model. Dr. Santangelo was awarded a Ruth L. Kirschstein National Research Fellowship from the National Institutes of Health. Dr Santangelo is currently finishing a study to evaluate the penetration of full-thickness articular cartilage by adenoviral vector and adeno-associated viral vector to assist with the selection of the optimal vector to deliver the selected siRNA sequences to knockdown IL-1 beta signaling. Dr Santangelo is expected to sit the qualifying examination for the PhD degree in 2007.

Dr. Akikazu Ishihara, a PhD graduate student, has completed over 30 courses in the study of molecular biology and research methods. Dr. Ishihara has been dedicated to defining the bone healing model to study bone morphogenetic protein [BMP] gene therapy for the acceleration of bone healing in horses, including quantitative gait analysis, quantitative computed tomography, torsional biomechanical testing and gene expression. This project successfully competed for funding from the Grayson Jockey Club research foundation in 2005. This work is completed and is ready for submission to the Journal of Orthopedic Research in 2007. Dr. Ishihara has completed an in vitro study to assess the adenoviral transfection efficiencies of the cell types anticipated to uptake his constructs in vivo and has completed the large scale production of his gene constructs needed for his studies and this paper was published in the American Journal of Veterinary Research in 2006. Dr. Ishihara has also received funding for a proposal on the kinetic and subjective evaluation in horses with hind limb lameness or neurologic gait abnormalities from the OSU Research Council. This proposal is a continuation of his work on quantifying lameness in horses using the force plate and published in 2005 in the American Journal of Veterinary Research. Dr. Ishihara received his Bachelor of Veterinary Science degree from Azabu University, School of Veterinary Medicine, Japan and completed a 2 year visiting clinician and scholars program at the Ohio State University followed by a competitive rotating equine internship at Louisiana State University prior to entering our PhD program. Dr. Ishihara is expected to sit his qualifying examination for the PhD degree in 2007.

Dr. Laura Hirvinen is a first year equine surgery resident and Masters of Science graduate student. She graduated from the University of Helsinki in Finland in 2005 and then completed an internship in one of the largest private equine practices in Scandinavia. Laura has a special interest in equine orthopedics as well as emergency surgeries. Currently she is studying the influence of bone cements on bone-screw interface as her Masters of Science project. Her project should add strength to implant repair of equine fractures. In addition, she is involved in a study looking at cardiac output in horses during colic surgery.
Dr. Martin Waselau is a third year equine surgery resident and Masters of Science graduate student. Dr. Waselau graduated from the Free University of Berlin, Germany in 2001. He received his doctoral degree (Dr. med. vet.) after completing his doctoral thesis at the Musculoskeletal Research Unit, Equine Hospital, University of Zurich in Switzerland in 2002. There, Dr. Waselau investigated biochemical and histological changes occurring in the process of aseptic loosening of titanium-aluminium-vanadium-implants. After completing his Internship in Equine Medicine and Surgery at the Kansas State University in 2003, he did a surgical fellowship at Texas A&M University and The Ohio State University officially sponsored by AO/ASIF. Dr. Waselau’s Masters project investigates the effect of an injectable magnesium adhesive on bone stability and healing in horses involving radiographic, computed tomographic and biomechanical evaluations. This work has been presented at the European College of Veterinary Surgeons and American College of Veterinary Surgeons annual scientific meetings in 2006. The manuscript “The effect of a magnesium adhesive cement on stability and healing of an equine metatarsal osteotomy” has been accepted for publication in the American Journal of Veterinary Research for 2007. Dr. Waselau has also published a case report in Veterinary Surgery in 2006 with the coauthors Drs. Bertone and Green on a novel approach to an orthopedic carpal arthrodesis. Dr. Waselau has completed a case review of Standardbred race horses treated with platelet-rich plasma here at The Ohio State University Galbreath Equine Clinic for suspensory injuries. This novel biologic therapy was pioneered here by Drs. Sutter and Bertone with initial research from the Comparative Orthopedic Research Laboratory published in the American Journal of Veterinary Research in 2004.

Dr. Benjamin Young is a radiology resident that completed a Masters of Science degree in 2006 on work detailing the imaging of equine bone from horses with osteoarthritis. Dr. Young received a Bachelor of Science degree in Biology magna cum laude (1996) and a DVM degree (2000), both from Colorado State University. Dr. Young completed an internship at Colorado State University (CSU), where he rotated through equine ambulatory, surgery, medicine, reproductive and radiology services. After his internship, Dr. Young spent another year at CSU working as a Clinical Instructor with the equine ambulatory department, which included primary clinical responsibility as well as course/clinical instruction. Dr. Young’s Master’s of Science project was on computed tomography (CT) imaging of equine joints and comparing the results with histology. This manuscript has been accepted for publication in the American Journal of Veterinary Research for 2007 and was funded by Equine Research Funds from OSU. Dr. Young’s project was presented at the American College of Veterinary Radiologist’s annual scientific meeting in 2005. Dr. Young is now as assistant professor with Texas A&M College of Veterinary Medicine.
Orthopedic Research Personnel

Dr. David M. Bolt is a Clinical Assistant Professor of Orthopedic Surgery at The Ohio State University College of Veterinary Medicine. Dr. Bolt’s undergraduate degree (Matura Typus B, 1987) was completed at Staedtisches Literargymnasium Kirchenfeld in Bern, Switzerland, and he completed his DVM degree and a rotating internship in equine medicine and surgery at the School of Veterinary Medicine also in Bern, Switzerland (1994). For his DVM degree, Dr. Bolt completed a thesis based on porcine parvovirus infection and resulting non-suppurative myocarditis and meningoencephalitis in piglets. Dr. Bolt also received his M.Sc. degree from Louisiana State University in Baton Rouge (2004) while completing a clinical residency in equine surgery. At Louisiana State University, he completed extensive research in the use of extracorporeal shock wave therapy for the treatment of navicular disease and musculoskeletal pain that resulted in two publications in the American Journal of Veterinary Research. In February of 2005, Dr. Bolt became a diplomate of the American College of Veterinary Surgeons. Dr. Bolt is currently working on an in vitro study of distressed equine cartilage cells and their response to combinations of common drug therapies used in horses to treat arthritis in the Comparative Orthopedic Research Laboratory. Dr Bolt’s clinical work specialized in orthopaedics and Dr. Bolt works closely with Dr Bertone in the clinics.

Dr. Lee Rise is in the second year of the Orthopedic Surgery residency program in the College of Medicine at The Ohio State University following a clinical internship in the Department of Orthopedics. Dr. Rise completed a 6 month research-intensive experience in the Comparative Orthopedic Research Laboratory as part of his orthopedic residency program and is expected to graduate from the program in June 2010. Dr. Rise graduated from medical school at the University of Florida in 2004 and received a B.A. in Interdisciplinary Natural Sciences from the University of South Florida. While in medical school, Dr. Rise participated in two research projects, the first with Dr. Peter Gearen investigating the intra-office evaluation of intra-articular infections using a rapid, fluorescent dye wet prep and the second on a study of fixation methods in allograft prosthesis composites. His research on AIDS-associated Kaposi’s Sarcoma was published in Acta Oncologica in January, 2002. Dr. Rise’s current project is evaluating the influence of bone morphogenetic protein-2 on the invasive and proliferative properties of human osteosarcoma cell lines. BMP-2 can be used to counteract bone loss and fractures secondary to tumor metastasis, but BMPs are also potent activators of cellular metabolism and possibly tumor expansion. Dr. Rise is expected to complete this research in 2007.

Dr. Robert Todd Gorsline is in his sixth year of a research-intensive orthopedic surgery residency in the Department of Orthopedics at The Ohio State University Medical Center. He is the first resident in the new 6 Year Research Track Program. Dr. Gorsline dedicated a year of research in the Comparative Orthopedic Laboratory (2004-2005) and has completed a project on three dimensional chondrocyte cell culture using a biodegradable polycaprolactone nanofiber scaffold and gene augmentation of the chondrocytes to accelerate chondrogenesis. Dr. Gorsline comes to us with a Medical Degree, awarded magna cum laude, from The Ohio State University, and research experience in the form of a research fellowship characterizing the effects of adrenergic agents on the biomechanics of the post-ischemic isolated rat heart. A scientific abstract of Dr. Gorsline’s work has been presented at the American Society of Gene Therapy annual scientific meeting in Washington D.C. and a manuscript is in preparation for publication in 2007.
Joe Ielapi is a graduating senior at the Ohio State University. He will graduate with honors in the spring of 2006 with a Bachelor of Science in Agriculture, majoring in Animal Science, with a double minor in Life Science and Molecular Genetics. Joe has been involved with many studies over the past two years during which he has completed an internship and honors project in order to graduate with distinction. He has assisted with equine and rat studies, as well as bench-top projects. His honors project compared the expression of Green Fluorescent Protein in Immunocompetent and Athymic Nude rat bone marrow-derived mesenchymal stem cells. He will be presenting his findings at the Denman Undergraduate Research Forum, as well as the College of Food, Agriculture, and Environmental Sciences Research Forum on campus. Joe has received an Undergraduate Student Research Scholarship, Undergraduate Student Government Academic Enrichment Grant, and CFAES Small Research Grant as a result of his work. He has been accepted into and will attend veterinary school in the fall.

Megan Cartwright is in the final year of her undergraduate degree and expects to graduate in June of 2006 with honors and distinction in Biochemistry. Since May of 2005, she has been working in the Comparative Orthopedic Research Laboratory on her senior honors thesis for which she has received several grants, including the Dean’s Undergraduate Research Fund, the Pressey Honors Endowment, and the Undergraduate Student Government Academic Enrichment Grant. The goal of her project is the successful knockdown of the expression of tumor necrosis factor-α, a molecule implicated in osteoarthritis-associated joint degradation, through a molecular biology technique known as RNA interference.

Congratulations to the past and ancillary members of the Comparative Orthopedic Research Laboratory. Specifically Amanda Johnson for completion of a Master of Science in Public Health, Becky Hancock for joining our laboratory for a Senior Honors Research Project, The Ohio State University, 2006-2007, to Kay Pfaff for completing her Senior Honors Research Project from Wilson College, 2006-2007 with research performed in our laboratory, and Mr. Joe Ielapi for his acceptance into the class of 2011 at The Ohio State University College of Veterinary Medicine.

Dr. Shannon Murray is a first year equine surgery resident and Masters of Science graduate student. Dr. Murray graduated from the University of California at Davis, School of Veterinary Medicine in 2005. Following graduation, she completed a one-year internship at Rood and Riddle Equine Hospital in Lexington, KY. At Rood and Riddle, Dr. Murray developed strong interests in both upper airway disease and orthopedics. Currently, Dr. Murray’s research in the Comparative Orthopedic Research Laboratory consists of investigating autologous biologic therapy to accelerate tendon healing in horses. Dr Murray has completed a pilot project evaluating a much needed new model of tendonitis in horses to begin investigating novel therapies.
The Comparative Orthopedic Molecular Medicine Research Suite

The Comparative Orthopedic Molecular Medicine Suite is room 325 of the Veterinary Academic Medical Building (VMAB). The VMAB is located at The Ohio State University’s Veterinary Campus and is a > 100,000 sq. ft. facility dedicated to research laboratories on the top 2 of 4 floors. The Comparative Orthopedic Molecular Medicine Suite is 1069 sq. ft. of laboratory space with bench tops, internet-connected workstations, shelving and cabinets contained in modules B, C and D. Room 325B is 550 sq. ft. dedicated to DNA processing and gene expression analysis and contains two laminar flow hoods, a –80C freezer, an Iso Temp – 20C freezer, refrigerator, Applied BioSystems Taqman 7000 Sequence Detection System (RT-PCR analyzer) and dedicated PC computer with Primer Express software, refrigerated Micro centrifuge, (2) MJ minicycycler PCR Centrifuge engines, a Sorvall RC-5C Microcomputer Controlled Super speed Refrigerated Centrifuge with changeable rotors, New Brunswick Incubator/Shaker, Eppendorf Electroporator 2510, electrophoresis gel-casting units, pH meter, analytical balance, water and dry baths, pipetters, supplies, glassware and other accessories necessary for molecular biology applications. Also in 325B, a central area houses a BioMate3 Spectrophotometer, Zylux Tube Luminometer, Kodak GelDoc Photography digital imaging system, and ultra Microplate reader served by a Dell 1.7 Gb processor. An iMac (1 Gb) computer with accessories including a digital still/video cam recorder, 6-card reader, and CD burning capabilities serves this section. This card reader serves as the computer interface for the digital image capture systems on the GelDoc, Olympus CK40 Inverted and CX41 Compound Microscope and Canon Elura 20 MC Video chip/digital camera. Room 325C is 450 sq. ft. dedicated to cell/tissue culture and vector propagation and contains two laminar flow hoods, one that operates at BSL2-level containment. The module contains (2) ThermoForma water jacketed forced air, reach-in CO2 incubators, water bath, pipetters, refrigerator, Maytag dishwasher, Barnstead thermolyne autoclave, tissue homogenizer, liquid nitrogen storage tank, Olympus CK40 inverted florescent microscope with viewing screen, Olympus DP12 digital camera and Olympus P330N color printer. A power G3 computer serves this section. Room 325D is 100 sq. ft. dedicated to imaging and processing and houses an Olympus CX41 phase-compound microscope with a camera and monitor, and a Zeiss stereomicroscope. This area is the processing center for the other modules and houses the common color printer, laser printer, and scanner. An iMac computer serves this module. A second laminar flow chemical hood is dedicated to decalcification of gross bone/cartilage specimens. Additionally, Dr. Bertone shares a 250 sq. ft. radioisotope laboratory equipped with two laminar flow hoods, CO2 jacket incubator, and scintillation counter for cell/tissue culture metabolic studies. Access is also available to all common equipment in the common laboratories on the 3rd and 4th floors of the Veterinary Medical Academic Building. These facilities include additional high-speed and ultra speed centrifuges, scintillation counters, sonicator, cryostat, controlled temperature rooms, dark room, autoclave room, ice maker, glassware facility, radiographic film processor, and fluorescence gel documentation equipment.
The Laboratory for Gait Analysis and Applied Research is Room 1338 of the Veterinary Hospital and is directly adjacent to the in ground force plate. This 425 sq. ft. laboratory contains an animal holding and working area separated from the equipment and laboratory area by containment rails. This laboratory is designed for direct evaluation of live research animals to permit short procedures using hospital equipment, such as fluoroscopy, ultrasound and quantitative computer tomography on research animals (rabbits, cats, sheep, dogs, horse, calves etc.) in a designated area. This section has a central drain, rubber floor, containment rails, hoses and cabinets. The laboratory section contains 32 sq. ft. of counter/working bench space, an under-counter refrigerator, 110 sq. ft. feet of locked cabinets, 6.8 sq. ft. of drawer storage space, two internet access ports, a desk and phone, and a sink. The entrance to room 1338 permits visualization of the in ground Kistler force plate (3 ft x 2 ft) in the 60 ft. hallway directly outside this laboratory. All connections to the forceplate feed into room 1338 which houses the designated gait analysis PC computer. A second computer, a portable G3 PowerMac Powerbook, services this laboratory.

Affymetrix GeneChip Expression Analysis

The Affymetrix node consists of all equipment and software to process the arrays and analyze our equine gene expression microarray data, as well as any other Affymetrix GeneChip. The node functions under the direction of Dr. Bertone and is housed 30 ft from her research laboratory. Affymetrix arrays are scanned at the Microarray Core Facilities at The Ohio State University James Cancer Institute or Davis Heart and Lung Institute, of which Dr. Bertone is member. The node is comprised of the Affymetrix Genechip Fluidics Station 400, the Affymetrix GeneChip Hybridization Oven 640, and a Dell Optiplex GX150 which uses the Affymetrix Microarray Suite 5.0 and Data Mining Tool software. The GeneChip probe array Fluidics Station 400 contains four modules; each module can hold one GeneChip probe array cartridge and can be run independently of the others. The Fluidics Station hybridizes, washes, and stains the GeneChip probe and tags. The GeneChip Hybridization Oven 640 is capable of hybridizing up to 64 probe array cartridges with precision temperature control. The Affymetrix Microarray Suite 5.0 controls the fluidics station, analyzes experimental data, generates report summaries, etc. Further bioinformatics support is available on an hourly basis from the Core Facilities.
Textbook Chapters


Refereed Article Publications in the last 3 years (2004-2006) (in print or accepted)

*Denotes first author as a graduate student/fellow/professional student and Dr Bertone as senior author.


Veterinary Practice News short on OSU stem cell/gene research. By Marcia King, Editor, 2006.


AAHA Newsstat. AAHA@aahanet.org, Injectable bone-repair solution studied as an alternative to surgery. Jan 12, 2005.


OSU researchers create gene chip for horses, Dispatch, Columbus, OH, Feb, 2004.


Proceedings Published in the Last 2 Years (2005-2006)


Activities
Equine Comparative Orthopedic Research


Abstracts Published in the Last 2 Years (2005-2006)


Zachos TA, Bertone AL. Adenovirus-mediated BMP-2 vs. BMP-6 gene delivery to accelerate mineralization in mesenchymal stem cells in monolyer and alginate cultures. The Ohio State University College of Veterinary Medicine Advances in Veterinary Medicine Book of Abstracts, pg MCB-35, 2005.

Ishihara A, Bertone AL, Zachos T. Relative sensitivity and permissiveness to adenoviral vector gene delivery in equine chondrocytes, synoviocytes, and adult bone marrow derived mesenchymal stem cells. The Ohio State University College of Veterinary Medicine Advances in Veterinary Medicine Book of Abstracts, pg MCB-13, 2005.


**Poster Sessions from the Last 2 Years (2005-2006)**


Hickson AR, Bertone AL. Gene expression profiling of equine endothelium in laminitis. The Ohio State University College of Veterinary Medicine Advances in Veterinary Medicine Research Day, April 14, 2005.

Zachos TA, Bertone AL. Adenovirus-mediated BMP-2 vs. BMP-6 gene delivery to accelerate mineralization in mesenchymal stem cells in monolayer and alginate cultures. The Ohio State University College of Veterinary Medicine Advances in Veterinary Medicine Research Day, April 14, 2005.

Ishihara A, Bertone AL, Zachos T. Relative sensitivity and permissiveness to adenoviral vector gene delivery in equine chondrocytes, synoviocytes, and adult bone marrow derived mesenchymal stem cells. The Ohio State University College of Veterinary Medicine Advances in Veterinary Medicine Research Day, April 14, 2005.


Awards in the Last 3 Years (2004-2006)

Research Adviser, First Place Life Sciences Division (Mr Ielapi recipient), Undergraduate Research Forum, OSU, 2006.

Research Adviser, Clinical Research Award Winner (Dr Ishihara, Travel Award), Advances in Veterinary Medicine Day, OSU, 2006.

Research Adviser, Sphinx Senior Class Honorary Award, TA Zachos (Recipient), 2006.

Research Adviser, Dean's Undergraduate Research Award. College of Biological Sciences. Megan Cartwright (Recipient), 2005.

Research Adviser, College of Food, Agriculture and Environmental Sciences Small Research Grant, Joe Ielapi (Recipient), 2005.

Research Adviser, The Ohio State University Undergraduate Student Government Academic Enrichment Grant, Joe Ielapi (Recipient), 2005.


Research Adviser, First Place Resident Research Publication (Dr Sutter, recipient), Department of Veterinary Clinical Sciences Competition, The Ohio State University, 2004.

Research Adviser, First Place Resident Research Presentation (Dr Munstermanrecipient), American College of Veterinary Surgeons, Resident's Competition, 2004.

Pfizer Research Award, College of Veterinary Medicine, 2004.

Research Adviser, Runner-Up Award Graduate Research Forum (Dr Zachos recipient), Molecular and Cell Biology Division, Advances in Veterinary Medicine Research Day, College of Veterinary Medicine, April 15, 2004.

Invention Disclosure 02ID39F 2002 Laser Peening to Strengthen Orthopedic Implants.

Invention Disclosure 04ID42U April 1, 2003 Custom Expression Microarray (Equine Genechip).

Invention Disclosure 04ID49U April 1, 2003 "Equine Affymetrix Gene Expression Microarray".
Seminars in the Last 3 Years (2004-2006)

2006

9 PRESENTATIONS
- FAEP, Ocala Florida, 2nd Annual Scientific Meeting, OH. (3)
- American Society for Gene Therapy, Baltimore, MD. (1)
- Orthopedic Research Society, San Diego, CA. (1)
- Large Animal Medicine Seminar, Musculoskeletal Diseases, Columbus, OH. (1)
- Surgery Seminar, Veterinary Clinical Sciences, OSU, Columbus, OH. (1)
- American College of Veterinary Surgeons Annual Scientific Meeting, Baltimore, MD. (1)
- IN SPINE AND ORTHOPEDICS Med Insight Technologies Meeting, Las Vegas, NV. (1)

2005

12 PRESENTATIONS, 3 LABS
- Affymetrix, Technologies on Parade, College of Veterinary Medicine, OH. (1)
- Winter 2005, Development Lecture, Naples, FL. (1)
- 25th Annual Veterinarian and Technician Conference on Medicine and Surgery, Rochester, NH. (3 plus 3 labs)
- Mallory Coleman Research Day, Columbus, OH. (1)
- American College of Veterinary Surgeons Annual Scientific Meeting, San Diego, CA. (3)
- Havemeyer Foundation Workshop, Estes Park, CO. (1)
- Sports Medicine Grand Rounds, Columbus, OH. (1)
- Medical Insight Technologies, Dallas, TX. (1)

2004

15 PRESENTATIONS, 1 LAB
- 50th Annual Meeting - Orthopedic Research Society, San Franscisco, CA. (3)
- Plant, Animal & Microbes Genomes XII Program; Bioinformatics Session, San Diego, CA. (1)
- Cornell University – DCS Guest Lecture Series, Ithaca, NY. (1)
- Surgery Seminar Series – Department Veterinary Surgery, Columbus, OH. (1)
- National Pedigreed Livestock Council Meeting – Toronto, CAN. (1)
- European Society for Veterinary Orthopedics and Traumatology, Munich, Germany. (3, lab)
- American Association of Equine Practitioners Focus on Joints Meeting, Louisville, KY. (2)
- American College of Veterinary Surgeons Meeting, Denver, CO. (2)
- Medtech Insight Investment in Innovation Meeting, Boston, MA. (1)

Editorial Contributions

Journal American Veterinary Medicine Association
American Journal Veterinary Research
Veterinary Surgery
American Journal Sports Medicine
Equine Veterinary Journal
Equine Veterinary Science
Journal of Orthopaedic Research
Clinical Orthopaedic and Related Research

Advisory Board

Bone Solutions, Inc.
<table>
<thead>
<tr>
<th>Year</th>
<th>Funding Amount</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>2005-07</td>
<td>$205,971</td>
<td>Bertone AL. Use of an isolated joint model for the study of kinetics of exposure by small molecules delivered by intra-articular injection. Pfizer Inc.</td>
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<td>2006</td>
<td>$500</td>
<td>Pressey Honors Student Research Grant. Megan Cartwright, (recipient), AL Bertone, (sponsor). University Honors and Scholars Center.</td>
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<td>2005</td>
<td>$300</td>
<td>Dean's Undergraduate Research Fund Award. College of Biological Sciences. Megan Cartwright, (Recipient) AL Bertone, (Project Advisor).</td>
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<td>2005-08</td>
<td>$172,000</td>
<td>1F32 AR053805-01 Ruth L. Kirshstein National Research Service Award, NIH/NIAMS. Knock-down of Interleukin-1 signaling in osteoarthritis. Santangelo K, (candidate), Bertone AL, (sponsor).</td>
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<tr>
<td>2004</td>
<td>$4,500.00</td>
<td>T35 Research Training Fellowship for Veterinary Students. NIH/NCRR. Amber-Renee Hickson, (Candidate) AL Bertone, (Sponsor).</td>
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<td>2003-2006</td>
<td>$193,050.00</td>
<td>F32 AR050916 Ruth L. Kirschstein National Research Service Award. NIH/NIAMS. TA. Zachos, (Candidate), AL Bertone, (Sponsor). Gene-augmented mesenchymal stem cells in bone repair.</td>
</tr>
<tr>
<td>2004</td>
<td>$14,545</td>
<td>Bertone AL, Hickson AR. The role of TNF-alpha and IL-1beta in laminitis: An invitro study. USDA Animal Health Formula Funds, Council for Research, The Ohio State University.</td>
</tr>
</tbody>
</table>
Funded Research and Scholarships in the Last 3 Years (2004-2006)

2004-2007 $4,500.00 T35 Research Training Fellowship for Veterinary Students. NIH/NCRR. Amber-Renee Hickson, (Candidate) AL Bertone, (Sponsor).


We appreciate the contributions of all those that are working with the program. Thank you!