BIOMEDICAL & VETERINARY SCIENCES

GRADUATE PROGRAM

ANNOUNCES

The Doctor of Philosophy Seminar and Examination of

Sarah M. Khatibzadeh, DVM, MS, Diplomate ACVS-Large Animal

"***In vitro*** **evaluation of equine bone-marrow derived mesenchymal stromal cells as a therapy to combat orthopedic biofilm infections"**

Friday, June 16th, 2023
8:00AM
Classroom 102

Bio

Dr. Sarah M. Khatibzadeh is a PhD candidate and Clinical Instructor in Large Animal Surgery at the Virginia-Maryland College of Veterinary Medicine (VMCVM). Originally from Dallas, Texas, she earned her Bachelor of Science in Animal Science (2010) and Doctor of Veterinary Medicine (2014) from Cornell University. She completed internships in equine surgery and medicine at New England Equine Practice (Patterson, NY, 2014-2015) and at the Marion DuPont Scott Equine Medical Center (Leesburg, VA, 2015-2016). Dr. Khatibzadeh subsequently completed a residency in Large Animal Surgery and Master of Science at the VMCVM (2016-2019). Her MS research focused on in vitro investigation of tendon regeneration and healing. Her PhD research centers on the potential of equine bone marrow stromal cells to disrupt bacterial biofilms and modulate the immune response to these biofilms in vitro.

Funded by

VMCVM Office of Research and Graduate Studies
Morris Animal Foundation Large Animal Training Fellowship
Regenerative Medicine Interdisciplinary Graduate Education Program
Equine Research Competition, VMCVM

Lay Language Abstract

Biofilms are coating layers made by bacteria to protect them from being killed by antibiotics or the immune system. This biofilm shield results in persistent infection, chronic inflammation and tissue destruction in horses with bone and joint infections. The resulting complications, including lameness, reduced athletic potential and quality of life, can require euthanasia in affected horses. Equine bone marrow-derived mesenchymal stromal cells (MSC) kill free floating bacteria in laboratory models and reduce inflammation in musculoskeletal injuries. Whether MSC can disrupt formed biofilms and reduce inflammation resulting from persistent biofilm infections is unknown. Using a laboratory model, our objectives were to determine: 1) whether MSC alone or with an antibiotic used to treat orthopedic infections in horses can disrupt biofilms and kill indwelling live bacteria of orthopedic infectious agents *S. aureus* and *E. coli,* and 2) whether MSC can modify the immune response to *S. aureus* biofilms. MSC demonstrated some biofilm reducing ability but performed differently on *S. aureus* versus *E. coli* biofilms. Specifically, MSC reduced the size of biofilms of both bacteria, reduced the coating layer of *S. aureus* biofilms alone and to a greater extent when combined with the antibiotic, and killed live *S. aureus* bacteria. Using the same system, culture of MSC with *S. aureus* biofilms and peripheral blood mononuclear cells (PBMC), a type of white blood cell, reduced biofilm size compared to controls. Culture of MSC and PBMC with *S. aureus* also increased detection of inflammatory cell and fatty acid-derived signals that promote resolution of inflammation, compared to controls. These results indicate that MSC may be useful to combat biofilm infections by breaking down the coating layer of biofilms, and provide insight into the immune response against orthopedic biofilms. Taken together, our results support continued investigation into the potential of MSC as a treatment for orthopedic biofilm infections in horses.

Awards and Adademic Achievements

- March 2023: Outstanding Oral Presentation, BMVS Annual Research Symposium, VMCVM, Blacksburg, VA
- March 2020: Diplomate Status: American College of Veterinary Surgeons - Large Animal
- February 2020: Phi Zeta Manuscript Award, Basic Science Category, VMCVM, Blacksburg, VA
- March 2019: Outstanding Masters Student Award, VMCVM, Blacksburg, VA
- October 2018: Residents' Forum, American College of Veterinary Surgeons, Annual Summit, Phoenix, AZ
- March 2018: Outstanding MS Poster Presentation, BMVS Annual Research Symposium, VMCVM, Blacksburg, VA
- May 2014: Novartis Surgical Excellence Award, Large Animal, College of Veterinary Medicine, Cornell University, Ithaca, NY

Awards and Adademic Achievements Continued

- April 2014: Outstanding Scientific Content (Poster), Annual Student Research Symposium, College of Veterinary Medicine, Cornell University, Ithaca, NY

- July 2013: Scholarship Competition Winner, Veterinary History Student Summit, American Veterinary Medical Association Convention, Chicago, IL

- May 2012-May 2014: Phi Zeta Veterinary Honor Society Member, College of Veterinary Medicine, Cornell University, Ithaca, NY

- December 2009: Bachelor of Science (Animal Science), *Summa cum Laude*, Distinction in Research, Cornell University, Ithaca, NY

Publications

Khatibzadeh SM, Menarim BC, Nichols AEC, Werre SR, Dahlgren LA. Urinary bladder matrix does not improve tenogenesis in an *in vitro* equine model. *J Orthop Res.* Aug 2019. 38(9):1848-1859.

SM Khatibzadeh and JA Brown. Surgical Management of Colic in the Foal. *The Equine Acute Abdomen, 3rd ed.* Ed. NA White, JN Moore, TS Mair. 2017.

WM Bradley, D Schilpp, and **SM Khatibzadeh**. Electronic brachytherapy used for the successful treatment of three different types of equine tumours. *Equine Vet Educ.* June 2017. 29(6): 293-298.

Khatibzadeh S, Gold C, Keggan A, Perkins G, Glaser A, Dubovi E, Wagner B. West Nile virus specific immunoglobulin isotype responses in vaccinated and infected horses. *Am J Vet Res.* December 2014. 76(1): 92-100.

Cummings KJ, Perkins GA, **Khatibzadeh SM**, Warnick LD, and Altier C. Antimicrobial resistance trends among *Salmonella* isolates obtained from horses in the northeastern USA, 2001-2013. *Am J Vet Res.* May 2016. 77(5): 505-513.

Cummings KJ, Perkins GA, **Khatibzadeh SM**, Warnick LD, and Altier C. Antimicrobial resistance trends among *Salmonella* isolates obtained from dairy cattle in the northeastern United States, 2004–2011. *Foodborne Pathog Dis.* April 2013. 10(4): 353-361.

Presentations

Khatibzadeh SM, Ducker WA, Caswell CC, Werre SR, Dahlgren LA, Bogers SH. *In vitro* evaluation of equine bone-marrow derived mesenchymal stromal cells as a therapy to combat orthopedic biofilm infections: the immunomodulatory potential. Research in Progress Seminar (BMVS 5944). VMCVM. April 2023. Podium presentation.

Khatibzadeh SM, Ducker WA, Caswell CC, Werre SR, Dahlgren LA, Bogers SH. Equine bone marrow-derived mesenchymal stromal cells disrupt the matrix of established orthopedic biofilms *in vitro*. Graduate and Professional Student Senate Research Symposium. Virginia Tech. March 2023. Podium presentation.

Khatibzadeh SM, Ducker WA, Caswell CC, Werre SR, Dahlgren LA, Bogers SH. Equine bone marrow-derived mesenchymal stromal cells disrupt the matrix of established orthopedic biofilms *in vitro.* BMVS Graduate Research Symposium. VMCVM. March 2023. Podium presentation.

Khatibzadeh SM, Dahlgren LA, Caswell CC, Ducker WD, Werre SR, Bogers SH. Equine Bone-marrow Derived MSC Reduce Matrix of Established Biofilms *in vitro.* Orthopaedic Research Society Annual Meeting. Dallas, TX. February 2023. Poster presentation.

Khatibzadeh SM, Ducker WA, Caswell CC, Werre SW, Dahlgren LA, Bogers SH. Equine MSC Reduce Orthopedic Biofilm Matrix. Department of Large Animal Clinical Sciences. VMCVM. November 2022. Podium presentation.

Khatibzadeh SM, Ducker WA, Caswell CC, Werre SW, Dahlgren LA, Bogers SH. Equine MSC Reduce Orthopedic Biofilm Matrix. American College of Veterinary Surgeons Summit. Portland, OR. October 2022. Podium presentation.

Presentations continued

Khatibzadeh SM. House officer mental health: solutions to improve care. Departments of Large and Small Animal Clinical Sciences. VMCVM. September-November 2022. Podium presentation.

Khatibzadeh SM, Ludwig EK, Elane G, Martinez J, Werre SR, Brown JA, Dahlgren LA. Serum amyloid A for the diagnosis and monitoring of septic arthritis in the horse. Department of Large Animal Clinical Sciences. VMCVM. September 2021. Podium presentation.

Khatibzadeh SM, Ducker WA, Caswell CC, Werre SW, Dahlgren LA, Bogers SH. Biofilm quantification for equine MSC antimicrobiosis. Research in Progress Seminar (BMVS 5944). VMCVM. April 2021. Podium presentation.

Khatibzadeh SM, Ducker WA, Caswell CC, Werre SW, Dahlgren LA, Bogers SH. Biofilm growth assessment for MSC treatment of equine orthopedic infections. Biomedical and Veterinary Sciences Research Symposium. VMCVM. March 2021. Podium presentation.

Khatibzadeh SM. Emergency Management of Synovial Sepsis in Adult Horses. Continuing Education Seminar. VMCVM. March 2021. Podium presentation. Khatibzadeh SM. Porcine Urinary Bladder Matrix in an *In Vitro* Equine Model of Tenogenesis. VMCVM. Blacksburg, VA. June 2019. Master of Science Defense Seminar.

Khatibzadeh SM. Diagnosis and Surgical Treatment of Conditions Affecting the Navicular Bursa. VMCVM. Blacksburg, VA. November 2018. Resident seminar.

Khatibzadeh SM, Menarim BC, Nichols AEC, Werre SR, Dahlgren LA. Effects of Urinary Bladder Matrix on Tenogenesis in vitro. American College of Veterinary Surgeons Summit, Residents' Forum. Phoenix, AZ. October 2018. Podium presentation.

Presentations continued

Khatibzadeh SM. Surgical Treatment of Guttural Pouch Mycosis in the Horse. VMCVM. Blacksburg, VA. May 2017. Resident seminar.

Khatibzadeh SM. Negative Pressure Wound Therapy in Large Animals: Current Literature, Cross-Species Comparisons and Future Directions. Blacksburg, VA. April 2018. Resident seminar.

Khatibzadeh SM. Serum Amyloid A in Equine Septic Arthritis. American Association of Equine Practitioners Student Chapter, Guest Seminar. VMCVM. Blacksburg, VA. November 2017. Podium presentation.

Khatibzadeh SM. Intraperitoneal Adhesions in the Horse: Pathophysiology, Prevention and Treatment. VMCVM. Blacksburg, VA. October 2017. Resident seminar.

Khatibzadeh SM. Serum Amyloid A in Equine Practice. Maryland Veterinary Medical Association Annual Conference. Ocean City, MD. June 2017. Podium presentation.

Khatibzadeh SM. Surgical Treatment of Guttural Pouch Mycosis in the Horse. VMCVM. Blacksburg, VA. May 2017. Resident seminar.
Khatibzadeh SM. Serum Amyloid A in Equine Septic Arthritis. VMCVM. Blacksburg, VA. December 2016. Resident seminar.

Khatibzadeh S, Gold C, Keggan A, Perkins G, Glaser A, Dubovi E, Wagner B. West Nile virus specific immunoglobulin isotype responses in vaccinated and infected horses. Cornell University, CVM, Student Research Competition. Best Scientific Content. Ithaca, NY. April 2014. Poster.

Khatibzadeh S. The Evolution of the Equine Surgery Specialty in the Twentieth and the Twenty First Centuries. AVMA 2013 Convention, Student Summit Scholarship Competition. Chicago, IL. Podium presentation.

Examination Graduate Committee

Major Advisor/Chair:

Sophie H. Bogers, BVSc, MSc, PhD, Diplomate ACVS-Large Animal (primary co-chair)
Assistant Professor, Large Animal Surgery
Department of Large Animal Clinical Sciences

Linda A. Dahlgren, DVM, PhD, Diplomate ACVS
Professor, Large Animal Surgery
Department of Large Animal Clinical Sciences

Graduate Advising Committee Members:

Clayton C. Caswell, PhD
Associate Professor, Bacteriology
Department of Biomedical Sciences and Pathobiology

William A. Ducker, BSc, PhD
Professor
Department of Chemical Engineering

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