Great Plains Emerging Infectious Diseases Conference

April 4, 2024

The University of Iowa

College of Public Health

Iowa City, Iowa

GREAT PLAINS EMERGING INFECTIOUS DISEASES CONFERENCE

April 4th, 2024
University of Iowa College of Public Health
Iowa City, Iowa

WELCOME to the thirteenth-annual Great Plains Emerging Infectious Diseases Conference sponsored by the University of Iowa College of Public Health, Department of Epidemiology, the Iowa State Hygienic Laboratory, the University of Iowa Center for Emerging Infectious Diseases (CEID), the National Institute for Antibiotic Resistance Research and Excellence, the Iowa State University College of Veterinary Medicine, One Health program, and University of Iowa Carver College of Medicine Global Health Programs.

This conference will serve to bring together public health professionals, researchers, faculty, and students in microbiology, infectious diseases, and related fields working in the Great Plains and Midwestern states. The GPEID Conference highlights basic, applied, epidemiological, and translational research in a true One Health fashion. Major topics may include but are not limited to antimicrobial resistance, zoonotic and vector-borne diseases including global health, healthcare-associated infections, molecular diagnostics and epidemiology, public health preparedness, and science communication.

We thank you for your participation and look forward to the many opportunities for intellectual exchange over the course of the conference and into the future.

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SCHEDULE

THURSDAY, APRIL 4TH, 2024

8:00-8:30a Check In | *College of Public Health (CPHB) Atrium*
Light Breakfast | *C217 CPHB*

8:30a Welcome | *C217 CPHB*

Dr. Christine Petersen, DVM, PhD
Director, Center for Emerging Infectious Diseases

9:00-10:00a Opening Keynote Presentation | *C217 CPHB*

Dr. Wendy Picking, PhD
T3SS: Converting a bane into a boon

10:00-10:15a Break

10:15-11:15a Abstract Talks | *C217 CPHB*

Dr. Eric Kontowicz, PhD, MPH
Association of Household size and Vaccination Status on Health Care Personnel SARS-CoV-2 Infection

Dr. Max Waugh, DVM, MPH
Systemic Clinical Parameters Correlate with the Dermal Immune Environment in Canine Leishmaniosis

Dr. Anthony Fischer, MD, PhD
Livestock-Associated Staphylococcus aureus in Cystic Fibrosis Respiratory Cultures

Francini Neves Ribeiro, MS, MV
Anatomical vascular difference and Leishmania-induced-vascular morphological changes are associated with high parasite load in skin of dogs infected with Leishmania infantum

11:30a-12:20p Keynote Presentation (Department of Epidemiology Seminar) | *N110 CPHB*

Dr. James Roth, DVM, PhD
The Need for Vaccines Against Transboundary Diseases of Food Animals for Pandemic Preparedness and Food Security

12:20-1:30p Lunch | *C217 CPHB*

Catered by Mammita's Coffee

SCHEDULE

1:30-2:45p How to find and launch careers across organizations in Infectious Diseases
Panelist Discussion | *C217 CPHB*

Tyler Baccam, MS
Epidemiologist, Pima County Health Department
Tucson, AZ

Dr. Kevin Esch, DVM, PhD, MPH, Dip. ACVP
Executive Director, Global PK, Dynamics, Metabolism and Safety
Zoetis, Kalamazoo, MI

Dr. Eric Kontowicz, PhD, MPH
Assistant Research Scientist, University of Iowa Hospitals and Clinics
Iowa City, IA

Amy Schwartz, MPH
(former) Epidemiologist, Vector Branch
Centers for Disease Control and Prevention
Ft. Collins, CO (now Iowa City)

Dr. Geneva Wilson, PhD, MPH
Research Health Scientist, Edward Hines Jr. VA
Chicago, IL

2:45-3:00p Break

3:00-4:00p Q & A with Keynote Speakers | *C210 CPHB*

Dr. Wendy Picking, PhD
Dr. James Roth, DVM, PhD

5:00p- Reception

Tribute Eatery & Bar
901 E Second Ave. Unit 100
Coralville, IA 52241

KEYNOTE ADDRESS

The 2024 keynote speakers are **Dr. Wendy Picking, PhD, and Dr. James Roth, DVM, PhD.**

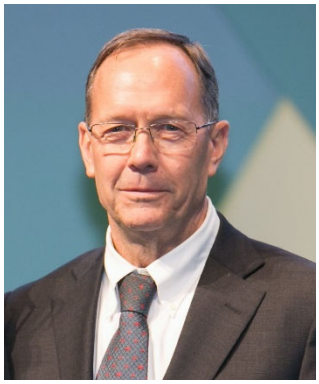
Dr. Wendy Picking, PhD
MizzouForward Professor
Department of Veterinary Pathobiology
School of Veterinary Medicine
University of Missouri-Columbia

Keynote Address
"T3SS: Converting a bane into a boon"
Thursday, April 4th, 9:00-10:00 a.m.
Room C217 CPHB

Wendy Picking is a MizzouForward Professor in Veterinary Pathobiology in the College of Veterinary Medicine at the University of Missouri-Columbia. She received her BA and PhD in the Department of Biochemistry at the University of Kansas. She did post-doctoral fellowships at the University of Texas at Austin and Washington University in St. Louis. After moving back to KU, Dr. Picking became a Research Assistant Professor secured NIH funding to examine the pathogenesis of *Shigella flexneri*, a diarrheal pathogen that is responsible for mortality and morbidity in children under the age of five in low-income countries. Upon moving to Oklahoma State University, she obtained funding from the NIH, the Bill and Melinda Gates Foundation and the PATH-Enteric Vaccine Initiative to perform proof of concept experiments to demonstrate the protective efficacy of the novel vaccine, which provided the foundation for new serotype-independent subunit vaccines. Now at MU, Dr. Picking's lab is expanding on these findings.

Without question the most powerful tool generated to date for protection of public health has been vaccination. While the low-hanging fruit has provided us with successful vaccines against scourges such as smallpox (now eradicated) and toxin-based diseases (e.g. diphtheria), more research-intensive efforts have put diseases such as polio on the verge of eradication. Vaccines against many of the bacterial pathogens have been more difficult to create due to, in many cases, the lack of effective adjuvants and the identification of conserved antigen targets that do not elicit serotype specificity. We have developed a platform that takes advantage of highly conserved and surface-localized type III secretion system proteins fused to LTA1, the active moiety of dmLT (double-mutant labile toxin from Enterotoxigenic *Escherichia coli*), formulated as an emulsion-based nanoparticle. We will specifically discuss our success with a vaccine to prevent the many infections caused by *Pseudomonas aeruginosa* and *Shigella flexneri*.

KEYNOTE ADDRESS



Dr. James Roth, DVM, PhD
Presidential Chair, Veterinary Microbiology and Preventative Medicine
College of Veterinary Medicine
Iowa State University

Keynote Address
"The Need for Vaccines Against Transboundary Diseases of Food Animals for Pandemic Preparedness and Food Security"
Thursday, April 4th, 11:30 a.m.-12:20 p.m.
Room N110 CPHB

Dr. Jim Roth is a Clarence Hartley Covault Distinguished Professor and Presidential Chair at the College of Veterinary Medicine at Iowa State University in the veterinary microbiology and preventive medicine department. He also serves as the ISU Center for Food Security and Public Health (CFSPH) director and executive director of the Institute for International Cooperation in Animal Biologics. With the development of the Veterinary Biologics Training Program, Roth and his team have provided an educational program covering the USDA process for approving vaccines and diagnostics for more than 25 years. The CFSPH has advanced medical education related to foreign animal diseases available to every veterinary college in the country. Roth currently focuses on Secure Food Supply projects; working with state and federal officials and industry in planning for optimal responses to transboundary and emerging diseases that threaten the food supply or public health. He has received numerous awards, including the Distinguished Veterinary Immunologist Award from the American Association of Veterinary Immunologists and the Public Service Award from the American Veterinary Medical Association. Additionally, he received the Senator John Melcher Public Service Award from the American Association of Veterinary Medical Colleges and the USDA APHIS Administrator's Award for lifetime achievements in animal health. He has testified before Congress on biosecurity preparedness, efforts to address bioterrorism and agroterrorism, and the need for vaccines for foreign animal diseases. Roth served on the National Science Advisory Board for Biosecurity from its inception in 2005 until 2014. Roth is a fellow of the American Association for the Advancement of Science and has been named to the National Academy of Medicine (2016). He is a Diplomat of the American College of Veterinary Microbiologists

LIST OF PANELISTS
in alphabetical order by last name

Tyler Baccam, MS
Epidemiologist, Pima County Health Department

Dr. Kevin Esch, DVM, PhD, MPH, Dip. ACVP
Executive Director, Zoetis

Dr. Eric Kontowicz, PhD, MPH
Assistant Research Scientist, University of Iowa Hospitals and Clinics

Amy Schwartz, MPH
Epidemiologist, Centers for Disease Control and Prevention

Dr. Geneva Wilson, PhD, MPH
Research Health Scientist, Edward Hines Jr. VA

LIST OF PRESENTERS AND TITLES – ORAL PRESENTATIONS
in order of appearance

Dr. Eric Kontowicz, PhD, MPH
University of Iowa Hospitals and Clinics, Department of Emergency Medicine
Association of Household size and Vaccination Status on Health Care Personnel SARS-Cov-2 Infection

Dr. Max Waugh, DVM, MPH
University of Iowa, Department of Epidemiology
Systemic Clinical Parameters Correlate with the Dermal Immune Environment in Canine Leishmaniosis

Dr. Anthony Fischer, MD, PhD
University of Iowa, Stead Family Department of Pediatrics
Livestock-Associated Staphylococcus aureus in Cystic Fibrosis Respiratory Cultures

Francini Neves Ribeiro, MS, MV
University of Iowa, Department of Epidemiology
Anatomical vascular difference and Leishmania-induced-vascular morphological changes are associated with high parasite load in skin of dogs infected with Leishmania infantum

Eric Kontowicz[1], Amanda K Irish[1], Kari K Harland[1], Anusha Krishnadasan[2], David A Talan[3], Patrick Ten Eyck[4], Mark T Steele[5], Efrat R Kean[6], Nicholas M Mohr[1], and Project PREVENT Network

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1 University of Iowa Hospitals & Clinics, 2 Olive View-University of California Los Angeles, 3 University of California-Los Angeles Medical Center, 4 University of Iowa, 5 University of Missouri-Kansas City, 6 Thomas Jefferson University Hospital

Association of Household size and Vaccination Status on Health Care Personnel SARS-Cov-2 Infection

Background: Contact to household members with confirmed COVID-19 illness has been shown to be the greatest risk factor for SARS-CoV-2 infection in healthcare personnel (HCP). Vaccination against SARS-CoV-2 in HCP has been shown to be effective at reducing infection for HCP and by 30-60% in unvaccinated adults in the same household. However, the importance of unvaccinated household members is less clear. The purpose of this study was to evaluate the association between household size and living with unvaccinated household members on SARS-CoV-2 infection in HCP. Additionally, we explored the relationship between living with children and SARS-CoV-2 infection in HCP.

Methods: This is a sub-analysis of an ongoing multicenter vaccine effectiveness study (PREVENT II). We included HCP who were tested for SARS-CoV-2 infection between July 16, 2022 and August 30, 2023 and collected additional information on household SARS-CoV-2 infection risk factors. HCP were enrolled as cases if they were diagnostically positive for SARS-CoV-2 and had at least one COVID-19 symptom. Controls were HCP who were diagnostically negative for SARS-CoV-2. Household characteristics and HCP past infection were obtained through HCP self-report by electronic survey; enrollment SARS-CoV-2 test and vaccination data were validated. Multivariable mixed-effects logistic regression was used to model the odds of SARS-CoV-2 infection, adjusted for age, sex, race/ethnicity, job, education, comorbidities, vaccination, and prior infection clustered on site and month of testing.

Results: We enrolled 3,121 HCP including 1,398 (44.8%) testing positive for SARS-CoV-2 at enrollment. Being exposed to a household member with test-confirmed COVID-19 illness 14 days prior to symptom onset was associated with higher odds of HCP SARS-CoV-2 infection (aOR = 2.57, 95%CI [2.04 – 3.23]) at time of enrollment (contemporary SARS-CoV-2 infection). Both HCP reported prior SARS-CoV-2 infection (aOR = 0.41 [0.34 – 0.49]) and HCP current vaccination (aOR = 0.77 [0.64 – 0.92]) were consistently associated with lower odds of SARS-CoV-2. Compared to living alone, HCP who lived with one other household member (aOR = 1.41 [1.10 – 1.80]) had increased odds of SARS-CoV-2 infection. Neither living with a child (aOR = 1.16 [0.92 – 1.45]) nor living with an unvaccinated individual (aOR = 0.91 [0.73-1.14]) were associated with increased odds of SARS-CoV-2 infection.

Conclusion: Our findings continue to suggest that exposure to a household member with confirmed COVID-19 illness remains associated with increased odds of HCP SARS-CoV-2 infection. Compared to HCP who live alone, those who live with others had higher odds of SARS-CoV-2 infection. Alternatively living with children or unvaccinated individuals was found to not increase the odds of infection for HCP. Our findings continue to show that vaccination remains an effective method to reduce the odds of infection. HCP vaccination and taking protective measures in the household to reduce exposure to household members with COVID-19 may reduce the likelihood of HCP infection.

ABSTRACTS

Max Waugh[1-3], Dylan Hendricks[1,2], Danielle Pessôa-Pereira[1,2], Karen Cyndari[2,4-5], Ashish Shukla[6], Tom Lynch[7], Helen Ashwin[8], Nidhi Dey[8], Christine Petersen[1-3]

[1]Department of Epidemiology, College of Public Health, University of Iowa, Iowa City, Iowa, USA. [2]Center for Emerging Infectious Diseases, Iowa City, Iowa, USA. [3]Interdisciplinary Graduate Program in Immunology, University of Iowa, Iowa City, Iowa, USA. [4]Department of Emergency Medicine, University of Iowa, Iowa City, Iowa, USA. [5]University of Iowa Hospitals and Clinics, Iowa City, Iowa, USA. [6]Infectious Disease Research Laboratory, Banaras Hindu University, Varanasi, India. [7]Department of Anatomy and Cell Biology, University of Iowa, Iowa City, Iowa, USA. [8]Department of Biology, University of York, York, UK

Systemic Clinical Parameters Correlate with the Dermal Immune Environment in Canine Leishmaniosis

Background: Leishmania infantum causes canine morbidity and mortality and is an important public health challenge due to the risk of zoonotic transmission. L. infantum has significant dermal tropism, and dermal parasite burden has been positively correlated with infectivity to feeding sand flies. Public health initiatives often focus on severe canine leishmaniosis due to concern about increased infectivity to sand flies. However, in xenodiagnoses studies, the most severe clinical cases had less transmission to naïve sand flies than mild to moderate cases, despite dermal parasite burden increasing as disease progressed. Previous research has evaluated the local immune events during a sand fly bite. This work aims to further characterize the dermal immune environment's relationship to clinical presentation and evaluate its influence on transmissibility.

Materials and methods: Formalin-fixed, paraffin-embedded skin samples from dogs vertically infected with L. infantum (n= 28, LeishVet (LV) 1 = 7, LV 2 = 12, LV 3 = 3, LV 4 = 6) were evaluated using RNAscope. An L. infantum amastin probe identified amastigotes, and a CD14 probe identified macrophages. Samples were imaged at 400X magnification on a confocal microscope, and the number of CD14+, amastin+, and amastin+/CD14+ cells in six randomly selected fields were counted. Creatinine and hematocrit were used as indicators of renal and bone marrow pathology respectively.

Results: Amastin+/CD14+ counts varied between and within clinical stages, with LeishVet 2 specifically having a wide range. Amastin+/CD14+ counts decreased as creatinine increased and increased as hematocrit decreased.

Conclusions: The wide range of dermal parasitism in LeishVet 2 samples potentially indicates clinical progression – early LeishVet 2 with low dermal parasitism as parasite replication is controlled, and late LeishVet 2 with high parasitism due to loss of control. The relationship between dermal parasitism and increasing creatinine is consistent with previous observations. Systemically elevated creatinine may negatively influence the dermal environment, decreasing infectiousness to feeding sand flies. Conversely, increased dermal parasitism in the presence of anemia could indicate parasite expansion in the bone marrow, resulting in anemia and increased parasite dispersion to the skin. This suggests that clinical presentation may influence the dermal environment and canine infectiousness to sand flies. Future work will further characterize this relationship to identify early risk factors for clinical presentation, facilitating identification of canine hosts with potentially high transmissibility.

ABSTRACTS

Anthony Fischer, Jose Zapata, Justin Krogh, Miah Boyle, Jared Hill, Valerie Reeb, Mary Teresi, Alexis Rozen, and Margaret Carrel
University of Iowa

Livestock-Associated Staphylococcus aureus in Cystic Fibrosis Respiratory Cultures

Background: Staphylococcus aureus is a major human pathogen and a leading bacterial cause of death worldwide. Some S. aureus lineages, including ST398, commonly infect livestock but are atypical in humans. These livestock-associated bacteria commonly acquire tetracycline resistance in response to antibiotics used for animal production. The prevalence of livestock-associated bacteria infecting vulnerable populations is not established.

Methods: We examined respiratory cultures from children and adults with cystic fibrosis (CF) who attend the University of Iowa CF center. S. aureus isolates were obtained retrospectively in from visits between 2008 and 2018 and prospectively from 2020-present. We analyzed S. aureus by short read whole genome sequencing and determined sequence type using Bactopia. We identified the most closely related genome assemblies from public databases using WhatsGNU and combined these with patient-derived isolates to perform phylogenetic analysis with RAxML. This approach was used to determine the clonality of S. aureus within patients and to ascertain whether the isolates were closely related to environmental isolates. Because the food supply is a potential route of inoculation, we obtained fresh ground pork from local grocery stores and cultured on selective media to determine whether tetracycline-resistant S. aureus are present.

Results: From our center of 250 patients, we identified 47 isolates of ST398 S. aureus from 12 unique patients since 2016. Patients with ST398 S. aureus were distributed geographically across nine Iowa counties, including urban and rural areas. Phylogenetic analysis revealed subjects had distinct strains. In one instance, the nearest match for a patient's strain was an agricultural isolate. One subject had two separate ST398 strains, suggesting multiple infection events. We isolated S. aureus from all samples of raw pork purchased at six local retailers. Five of the six pork samples yielded tetracycline-resistant colonies.

Conclusions: 12 patients with CF in this center (4.7%) have respiratory cultures positive for ST398 S. aureus. These infections were in rural and urban counties, arguing against occupational exposure. Infections were unique by patient, suggesting that there is not strain sharing between patients within the center. Handling of raw meat represents a potential source of inoculation with tetracycline-resistant bacteria.

Francini Ribeiro[1,2], Tainã de Souza[1,2], Rodrigo Menezes[3], Lucas Keidel[3], João Paulo dos Santos[4], Igor da Silva[4], Marcelo Pelajo-Machado[4,5], Fernanda Morgado[2*] and Renato Porrozzi[1]

1 Protozoology Laboratory, IOC - FIOCRUZ, Rio de Janeiro, Brasil
2 Immunoparasitology Laboratory, IOC - FIOCRUZ, Rio de Janeiro, Brasil
3 Clinical Research Laboratory for Dermatozoonoses in Domestic Animals, INI - FIOCRUZ, Rio de Janeiro, Brasil
4 Experimental Medicine and Health Laboratory. IOC - FIOCRUZ, Rio de Janeiro, Brasil
5 Brazilian National Institute of Science and Technology on Neuroimmunomodulation, IOC - FIOCRUZ, Rio de Janeiro, Brazil

Anatomical vascular difference and Leishmania-induced-vascular morphological changes are associated with high parasite load in skin of dogs infected with Leishmania infantum

Background

Canine Leishmaniosis (CanL) caused by *Leishmania infantum,* affects virtually all organs, including the skin.The highly parasitized skin serves as a source of infection for sand fly vectors. Dogs have intense collateral blood flow to adjacent areas of the skin due to the extensive connections between vascular plexuses. This study aimed to evaluate the association between the increase in the number and diameter of blood vessels and the spread of parasite load in the ear and abdominal skin of infected dogs apparently healthy or with CanL.

Materials and methods

Thirteen ear skin samples and thirteen paired abdominal skin samples of infected dogs apparently healthy or with CanL were included in the study. Histopathologic analysis: The samples were formalin-fixed, paraffin-embedded, and stained with hematoxylin and eosin. All structures in each tissue section that presented morphology compatible with blood vascular endothelium were considered for measurement. Immunohistochemistry: Samples were incubated with a polyclonal rabbit anti-*Leishmania* sp. Antibody and with a monoclonal antibody against VEGF (vascular endothelial growth factor).

Results

Amastigotes were observed parasitizing cells around blood vessels, inside blood vessels, and distributed diffusely in the skin. The ear skin showed a higher parasite load, a higher number and larger diameter of blood vessels, and higher expression of VEGF. Furthermore, skin fragments with a greater number of blood vessels and larger vascular diameters also exhibited more diffuse amastigote distribution in the skin.

Conclusions

An increase in the number and diameter of blood vessels in the skin of dogs with CanL may play a role in the influx of cells from the vessels into the tissue and in parasite dissemination. The ear skin showed an increase in the number and diameter of blood vessels associated with a high load and wide distribution of amastigotes, which makes it a choice site for diagnostic sampling, as well as the region most likely to serve as a source of parasites for the insect vector compared to the abdominal skin.

LIST OF CONFERENCE ATTENDEES & INSTITUTION INFORMATION

Tyler Baccam
Pima County Health Department
Tyler.baccam02@gmail.com

Erik Bergren
Augustana College
Erikbergren21@augustana.edu

Dustin Bosch
University of Iowa
Dustin-bosch@uiowa.edu

Tyler Brock
Siouxland District Health Department
tbrock@siouxlanddistricthealth.org

Grant Brown
University of Iowa College of Public Health
Grant-brown@uiowa.edu

KB Butler
University of Iowa
Katherine-l-butler@uiowa.edu

Svetlana Cociu
State University Medicine and Pharmacy
Testemitanu
Svetlana.cociu@usmf.md

Josh Cook
Unitypoint Health
Joshua.cook@unitypoint.org

Lillie Cuatt
University of Iowa
lgcuatt@uiowa.edu

Karen Cyndari
University of Iowa
Karen-cyndari@uiowa.edu

Jocelyn Demiglio
Luther College
Demijo01@luther.edu

Precious de-Winton Cummings
University of Iowa
Precious-junia-de-wintoncummings@uiowa.edu

Kayla Duxbury
University of Iowa
Kayla-duxbury@uiowa.edu

Glenda Dvorak
Iowa State University Center for Food Security and Public Health
gdvorak@iastate.edu

Kevin Esch
Zoetis
Kevin.esch@zoetis.com

Anthony Fischer
University of Iowa
Anthony-fischer@uiowa.edu

Angie Ghrist
Scott Community College
aghrist@eicc.edu

Anna Giudici
University of Iowa
Anna-giudici@uiowa.edu

Siri Hokanson
Luther College
Hokasi01@luther.edu

Amanda Irish
UIHC – Department of Emergency Medicine
airish@uiowa.edu

Lauren Johnson
University of Iowa
Lauren-johnson@uiowa.edu

Eric Kontowicz
University of Iowa Hospitals and Clinics
Eric-kontowicz@uiowa.edu

Justin Krogh
University of Iowa
Justin-krogh@uiowa.edu

Ian Kron
University of Iowa
Kronian1419@gmail.com

LIST OF CONFERENCE ATTENDEES & INSTITUTION INFORMATION

Elena Kuczkowski
Augustana College
Elenakuczkowski21@augustana.edu

Kelli Kulikova
Yerevan State Medical University
Kel.kulikova@gmail.com

Ragan Martin
University of Iowa
Ragan-martin@uiowa.edu

Claire Mathias
Iowa State University CVM
cmathias@iastate.edu

KariAn Mulford
University of Iowa
Karian-mulford@uiowa.edu

Bishal Parajuli
University of Iowa
Bishal-parajuli@uiowa.edu

Christine Petersen
University of Iowa
Christine-petersen@uiowa.edu

Bill Picking
University of Missouri
pickingw@missouri.edu

Wendy Picking
University of Missouri
Wendy.picking@missouri.edu

Francini Neves Ribeiro
University of Iowa/Fiocruz
Francini-ribeiro@uiowa.edu

Jim Roth
Iowa State University
jaroth@iastate.edu

Phoebe Rosen
Iowa State University
Phoebe.rosen12@gmail.com

Danielle Roxas
Augustana College
Danielleroxas21@augustana.edu

Junita Sangare
Luther College
Sangju01@luther.edu

Aaron Scherer
University of Iowa
Aaron-scherer@uiowa.edu

Amy Schwartz
University of Iowa
amyschwartz@uiowa.edu

Jim Torner
University of Iowa
James-torner@uiowa.edu

Jessica Tucker
University of Iowa
Jessica-tucker@uiowa.edu

Max Waugh
University of Iowa
Max-waugh@uiowa.edu

Geneva Wilson
Edward Hines Jr VA Hospital
Gmwphd88@gmail.com

Jose Zapata
University of Iowa Stead Family Department of Pediatrics
Jose-zapata@uiowa.edu

Michaela Zimmer
University of Iowa
Michaela-zimmer@uiowa.edu

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https://www.siouxlanddistricthealth.org/about-us/employment-opportunities

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Iowa State University College of Veterinary Medicine
https://vetmed.iastate.edu/

Nicolae Testemitanu State University of Medicine and Pharmacy of the Republic of Moldova
https://usmf.co.il/en/

Luther College
https://www.luther.edu/

Yerevan State Medical University
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Augustana College
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