75th Anniversary Meeting of the American Association of Veterinary Anatomists

Learn * Teach * Research * Collaborate

Celebrating 75 Years of Commitment to Veterinary Anatomy

AAVA * 2025

Hosted at the University of Saskatchewan, Western College of Veterinary Medicine, Department of Veterinary Biomedical Sciences

July 31–August 2, 2025, Saskatoon, Saskatchewan, Canada

75th Anniversary Meeting of the American Association of Veterinary Anatomists

Hosted at the
University of Saskatchewan
Western College of Veterinary Medicine
Department of Veterinary Biomedical Sciences

July 31st - August 2nd, 2025
Saskatoon, Saskatchewan, Canada

Local Organizing Committee

Chair	Baljit Singh
Members	Daniel MacPhee
	Jaswant Singh

Scientific Review Committee

Co-chairs	Jaswant Singh
	Daniel MacPhee
Members	Brent Bobick
	Madison Ricard
	Ram Saran Sethi

Technical Support

Members	Julie Beres
	Alice Der
	Nicole Wood
	Laura Harris

Message from the Chair of Local Organizing Committee

Dear Colleagues,

The American Association of Veterinary Anatomists (AAVA) is a distinguished professional body that was established in 1948. We at the University of Saskatchewan (USask), which is part of Canada's U15 group of research-intensive universities, feel privileged to host the 75th anniversary conference of the AAVA. One of the highlights of my career has been to serve as President of the AAVA.

Anatomical sciences form the foundation of medical and veterinary education programs. The link between structure and function requires one to comprehend the structure, and the teaching of all aspects of anatomy helps us do that. Despite the ongoing reduction in time allocated to the teaching of basic sciences including anatomical sciences, anatomists continue to excel – not only by advancing rigorous and integrated instruction but also by making fundamental contributions to the discovery of new knowledge.

USask's Western College of Veterinary Medicine (WCVM) celebrated its 60th anniversary this year! WCVM was established as a regional college to serve the four western Canadian provinces. Through its culture of collaboration, the College has gained an international reputation for developing thoughtful, interdisciplinary teaching and research programs. The WCVM team received the national Alan Blizzard Award for Collaborative Teaching from the Society for Teaching and Learning in Higher Education for the development of Biomedical Rounds. The globally-renowned Vaccine and Infectious Disease Organization and the Toxicology Centre at USask were established by WCVM scientists.

We are all delighted to have you with us and hope you will enjoy your time at USask and in Saskatoon.

Baljit Singh, FCAHS, BVSc&AH, PhD
3M National Teaching Fellow
Vice-President, Research
Professor of Veterinary Anatomy

Message from the AAVA President

Dear Colleagues,

On behalf of the executive committee of the American Association of Veterinary Anatomists, I am thrilled to welcome you to the 2025 AAVA Conference. The local committee has been working tirelessly to organize this event. I appreciate their efforts in hosting faculty and students dedicated to advancing the science and teaching of veterinary anatomy. This year marks the 75th anniversary of the AAVA, celebrating decades of commitment to advancing veterinary anatomy.

I have been honored to serve as the AAVA president since 2023. My goal has been to support anatomists at all levels. I established awards for anatomists in training (the Rising Anatomist Visiting Award), for mid-level experienced anatomists who have made significant contributions to anatomical sciences research and education (the AAVA Fellow status), for retirees who have provided us with excellent teaching, research, and notable service while contributing to the advancement of the field (Distinguished Retiree Award), and for our outstanding technical support staff who ensure seamless laboratory operations and offer teaching support (Technical Staff Excellence Award).

I am excited about our new website (vetanatomists.us) and proud to have led this change. I will continue to serve the association I consider home, and I look forward to my successor's accomplishments and the further advancement of the association.

Our association is growing. There is always excitement in welcoming new members. We are thrilled to announce an increase in the number of members of the American Association of Veterinary Anatomists! This growth reflects a renewed enthusiasm for advancing veterinary anatomical sciences, highlighting our expanding community of dedicated professionals, educators, and researchers. Together, we are shaping the future of veterinary anatomy!

This conference offers an invaluable opportunity to connect with colleagues, share intriguing research, discuss innovative teaching methods, and strengthen the collaborative spirit that defines our field. As veterinary anatomists, we lay the groundwork for clinical

practice, research, and veterinary education. It is through forums like this that we continue to evolve and lead.

We encourage you to take full advantage of the scientific sessions and networking events. Whether you are presenting your work, engaging in scholarly dialogue, or mentoring the next generation of anatomists, your contributions are what make this conference meaningful and impactful.

Thank you for being a part of this vibrant community. We look forward to an inspiring and productive meeting!

Shireen Hafez, DVM, PhD, PGCertVetEd, FHEA, PgDipVetEd
President - American Association of Veterinary Anatomists

AAVA Executive Committee

President	Shireen Hafez
Membership Secretary	Karen Hershberger
Corresponding Secretary	Abby Brown
Past President	David Cross
President-Elect	Tiana Magee

75th Anniversary Meeting of the American Association of Veterinary Anatomists

July 31 to August 2, 2025

Department of Veterinary Biomedical Sciences
Western College of Veterinary Medicine, University of Saskatchewan
52 Campus Drive, Saskatoon, Saskatchewan, S7N 5B4, Canada

Program

July 31, 2025

2:00 pm – 4:00 pm Registration (Western College of Veterinary Medicine - top of ramp, 2nd floor)

6:00 pm - 8:00 pm Informal reception hosted by Baljit Singh and Sarbjit Gill at their home

Friday, August 1, 2025

Session I *(Chair – Jaswant Singh)*

8:00 am Coffee/tea

8:15 am – 8:30 am Welcome to the WCVM and introduction of the keynote speaker

8:30 am - 9:30 am *Keynote Presentation*
The bovine utero-placental unit – state of the art. Christiane Pfarrer, Hollenbach J (Abstract #1)

9:30 am - 9:45 am **Synchronization of Wave emergence and dominant follicle regression with a GnRH antagonist (Cetrorelix) in cattle.** Dylan Farmer, Leonardi C, Campbell J, Singh J (Abstract #2)

9:45 am - 10:00 am **Multimodal imaging insights on T Cell localization in cyclic corpus luteum of buffalo via immunohistochemistry and electron microscopy.** Kritima Kapoor, Singh O and Pathak D (Abstract #3)

10:00 am - 10:15 am **A comparative study on the lipid profiles of goat oocytes during summer and winter.** Kaur D, Devendra Pathak, Singh N, Singh O, Uppal V, Singh J (Abstract #4)

Refreshment Break

10:15 am – 10:45 am Hallway outside the Lecture Theatre 2115

Session II *(Chair – Baljit Singh)*

10:45 am – 11:15 am *Invited presentation*
From macrophage diversity to neutrophil dysregulation: Decoding respiratory disease mechanisms in water buffalo. Ram Saran Sethi (Abstract #5)

11:15 am – 11:30 am **Investigating the role of Inhibitory Factor-1 (IF1) in ozone-induced lung inflammation**. Mohammad Umar, Aulakh G (Abstract #6)

11:30 am – 11:45 am **Trabecular pruning: A suggested mechanism of bone functional adaptation in young mammals, trading trabecular quantity for quality.** Meir M Barak (Abstract #7)

11:45 am – 12:00 am **Anatomy of the giraffe foot.** Ray Wilhite (Abstract #8)

Lunch

12:00 pm – 1:15 pm Lunch in the WCVM Buffeteria

Session III *(Chair – Madison Ricard)*

1:15 pm – 1:45 pm *Invited presentation*
Pedagogy of fairness in teaching anatomy. Shireen Hafez (Abstract #9)

1:45 pm – 2:00 pm **Prompts for success: Use of structured questions to enhance self-regulated learning and promote metacognition of first-year veterinary students in a veterinary anatomy course.** Karen Hershberger-Braker (Abstract #10)

2:00 pm – 2:15 pm **A Comparative Study of Cadaveric Canine Anatomy Learning Modalities for Novice and Intermediate Learners.** Kenny Ivie, Martin J, Cain M, Case S, Svec P, Foulk L, Mango D, Evans E, Reavill-O'Toole E, Magee C (Abstract #11)

2:15 pm – 2:30 pm **Optimizing the preparation of osteological specimens for education, research, and display.** Ors Petnehazy, Zucker E (Abstract #12)

2:30 pm – 2:45 pm **Introduction of a remediation process to support student learning in veterinary anatomy**. Emily Truckenbrod, Brown S, Larsen R, Freedman D, Brown A (Abstract #13)

Refreshments

2:45 pm Hallway outside the Lecture Theatre 2115

CLS Tour

3:00 pm – 4:00 pm Canadian Light Source Tour of Facilities (walk to CLS from WCVM). Please sign up via Doodle poll.

AAVA General Body

4:30 pm – 5:30 pm AAVA General body meeting

Saturday, August 2, 2025

Session IV *(Chair – Daniel MacPhee)*

8:00 am Coffee/tea

8:30 am – 9:00 am *Invited presentation*
Lab-grown testis: A novel tool for the assessment of testis organogenesis. Cham TC, Ali Honaramooz (Abstract #14)

Trainee Competition

9:00 am – 9:15 am **Neuroanatomical sexual dimorphism of GnRH and kisspeptin systems in South American camelids.** Md Shihabul Arif, Carrasco RA (Abstract #15)

9:15 am – 9:30 am **Molecular imaging of oxidative stress-induced acute lung inflammation using ^{89}Zr-labeled angiostatin.** Ankon Das, Florence T, Rodrigues C, Ambros B, Singh J, Fonge H, Aulakh G (Abstract #16)

9:30 am – 9:45 am **Uterine Smooth Muscle Cell Adaptation to Mechanical Stretch Mediated by Stress Proteins**. Shayla Jesse, MacPhee DJ (Abstract #17)

9:45 am – 10:00 am **Evaluating utilization of supplemental first year veterinary anatomy learning resources.** Konnor Stueve, Rendahl A, Truckenbrod E, Brown S (Abstract #18)

10:00 am – 10:15 am **Assessing the integration of virtual dissection tables into veterinary anatomy curricula: A pilot study.** Sophia Pankoke, Sarah Gniesmer, Kleinsorgen C, Pfarrer C (Abstract #19)

Refreshment Break

10:15 am – 10:45 am Hallway outside the Lecture Theatre 2115

Session V (Poster Session)

Posters should be put on the boards the morning of Friday, August 1 and taken down after lunch on Saturday, August 2. We expect trainee competition poster presenters will give a 3-minute presentation + 7 min for the questions. All remaining presenters will give a 5-minute presentation (including questions) at their posters.

Trainee Poster Competition Presentations (3+7 min each)

10:45 am – 10:55 am **Improving student spatial and anatomical understanding of the larynx using 3D printed equine larynges.** Sam R Fisher, Martin JF, Nigussie F, Svec PM, Fails AD, Wilhite DR, Magee C (Abstract #P1)

10:55 am – 11:05 am **Examination of the luminal distensibility of the canine esophagus at three potential points for obstruction.** Lyta Foulk, Mango D, Hennet M, Ferriman C, Svec P, Dillenbeck L, Grochal B, Magee C (Abstract #P2)

11:05 am – 11:15 am **Potential *in vitro* effects of vaping on formation of testis tissue.** Jason Fu, Letham L, Martinez Rivera MS, Valencia Camacho AM, Cham TC, Honaramooz A (Abstract #P3)

11:15 am – 11:25 am **Single-Cell RNA sequencing reveals the transcriptomic landscape of testes in Sertoli cell Connexin 43-deficient and wild type mice.** Sarah Gniesmer, Langeheine M, Herrmann D, Neufeld G, Klein C, Brehm R (Abstract #P4)

11:25 am – 11:35 am **Comparison of two chemical immobilization agents and the effect of antibiotics on bison semen.** Sergio Pezo, Shury T, Rajapaksha K, Anzar M (Abstract #P5)

11:35 am – 11:45 pm **CD34 deficiency attenuates OVA-Induced pulmonary intravascular macrophage recruitment in both male and female mice.** Carolina Rodrigues, Nascimento A, Aulakh G, Singh B (Abstract #P6)

Poster Presentations

11:45 pm – 12:30 pm

Using online learning to reinforce knowledge and skills necessary for vet students to perform neurological exams. Gretchen Williams, Ritter N, Hoffman H. (Abstract #P7)

Comparative evaluation of scrotal, pre-scrotal and caudal abdominal orchiectomy approaches in rabbits (*Oryctolagus Cuniculus*). Abubakar AA, Nnamdi P, Shaibu M Atabo, Yakubu AS, Buhari S, Oviawe I, Ahmad US, Abubakar N, Bodinga HA, Bedi I (Abstract #P8)

Creation of a virtual canine skeleton (3D model), a primer for a virtual reality (VR) immersive experience. Hand CR, Almon A, Fordham M, Kongara K, Chandru Charavaryamath (Abstract #P9)

Immunolocalization of vimentin and PCNA in the uterine tube of buffalo during summer and winter. Seal T, Anuradha Gupta, Uppal V, Pathak D and Bansal N (Abstract #P10)

Assessing variation significance in select vascular patterns of the canine head. Irina Irimescu, Crisan MI (Abstract #P11)

Learning embryology in 3D by integrating clay modeling in veterinary anatomy pedagogy: An immersive hapto-visual approach. Kritima Kapoor, Gupta A (Abstract #P12)

Creation of a 3D animated model of the equine guttural pouch to enhance student learning. Whitaker H, Almon A, Fordham M, Charavaryamath C, Kavitha Kongara (Abstract #P13)

An analysis of student performance when companion animal and large animal anatomy courses are taught sequentially. M Cathleen Kovarik (Abstract #P14)

Morphological and immunohistochemical investigations on canine uterine tissue obtained from ovariohysterectomy. Chahal K, Devendra Pathak, Kumar A, Singh O, Uppal V, Gupta K (Abstract #P15)

Advancing Veterinary Anatomy Education: Evaluation of Formaldehyde-Free Embalming Techniques for Canine Cadavers. Paulina Svec, Case S, Foulk L, Mango D, Evans E, Ivie Jr K, Martin J, Magee C (Abstract #P16)

A multifunctional Nesfatin-1-Like peptide in the endocrine pancreas of domestic animals. Covez J, Unniappan S (Abstract #P17)

SARS-CoV-2 infection causes extracellular matrix dysregulation without altering islet structure in the pancreas of male Syrian golden hamsters. Sasikumar S, Kelvin AA, Swan C, Mustapha UF, Suraj Unniappan (Abstract #P18)

A teaching tool for interpreting cross-sectional images. Glover E, Robert McCorkell (Abstract #P19)

Lunch

12:30 pm – 1:30 pm Lunch in the WCVM Buffeteria

Session VI

1:30 pm – 2:00 pm Anatomy tour

2:00 pm – 3:00 pm Panel discussion in dissection hall

3:00 pm – 4:00 pm AAVA awards and Trainee awards

Wanuskewin Heritage Park Tours and Dinner

4:00 pm Leave for Wanuskewin Heritage Park

4:30 pm Arrival to Deer-Eagle Room

5:00 pm – 6:00 pm Step Back in Time Tour or Bison Walk

6:30 pm Dinner

7:00 pm – 7:15 pm President's closing address

7:15 pm – 7:30 pm Vote of thanks

7:30 pm – 7:50 pm Dance Presentation - Kehkehk (The Hawk)

8:00 pm Return to Hotels

CONFERENCE ABSTRACTS

Oral Presentations

The bovine utero-placental unit – state of the art

Pfarrer C., Hollenbach J.

Institute for Anatomy, University of Veterinary Medicine Hannover, Hannover, Germany.

In bovine pregnancy, two time periods are clinically and economically relevant, early gestation, since the majority of embryonic loss occurs around implantation, and post-partum, because retained fetal membranes are the cause for (endo-)metritis. To improve the understanding of physiology and to develop prophylaxis/therapies for resulting pathologies, the bovine utero-placental unit was subject of extensive research. One focus was on the development of 2- and 3-dimensional in vitro models. Due to the complexity of the in vivo conditions, the influence of potentially stimulating or compromising molecules was examined in cell lines isolated from the maternal and fetal compartments. Cotyledon-condition media or interferon tau as the ruminant-specific pregnancy recognition signal had stimulating biological effects in vitro, which could support bovine embryo development and implantation. Beta-Hydroxybutyrate, a marker for a negative energy balance induced negative effects and an inflammatory response. Another aspect was to improve the understanding of trophoblast giant cells (TGC) that seem to be key-players in bovine placentomes. TGC are continuously formed and migrate towards the maternal epithelium to fuse with single uterine epithelial cells. Doing so they deliver their hormonal products to the maternal compartment. Just prior to parturition their number decreases significantly and the uterine epithelium flattens. Despite many electron microscopical studies, the underlying processes are still not clear. The recent introduction of serial-block-face scanning electron microscopy allowed ultrastructural analysis and 3-dimensional reconstruction of the fetomaternal interface. Interestingly, TGC maintained contact with the fetal basement membrane much longer than expected. Pseudopodia making contact with maternal epithelial cells differed in their shape and size depending on the degree of maturity. Only 3-dimensional reconstruction allowed to determine the number of nuclei. Despite the inherent limitations of descriptive morphological studies and in vitro models, it was possible to shed light on specific aspects that may influence the reproductive success in vivo.

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Funding: German Research Foundation (DFG) INST 193/57-1 FUGG

Synchronization of Wave Emergence and Dominant Follicle Regression with a GnRH Antagonist (Cetrorelix) in Cattle

Farmer D.[1], Leonardi C.[2], Campbell J.[3], Singh J.[1]

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Estradiol-based protocols are widely used for breeding management in cattle; however, the use of estradiol in food animals is banned in many countries. We examined the effects of a GnRH antagonist, cetrorelix, on ovarian dynamics and synchrony of wave emergence in cattle to develop a simple, effective, and estrogen-free artificial insemination protocol. We tested the hypotheses that Cetrorelix will: 1) suppress the growth and function of the extant dominant follicle; 2) induce emergence of a new follicular wave at a consistent time after treatment; 3) not alter the corpus luteum (CL) life span. In Experiment 1, heifers were given 1.5 mg cetrorelix im on Days 1 and 2 (Cetro1-2, pre-selection phase of the dominant follicle; Day 0=wave emergence), Days 3-4 (Cetro3-4, selection phase), and Days 6-7 (Cetro6-7, static phase), or normal saline (Control, n=8 per group). The dominant follicle was smaller regressed earlier in Cetro1-2 and Cetro3-4 than in the Control (P=0.01). CL diameter tended to be smaller (P=0.07) but cetrorelix treatment did not affect plasma progesterone, CL vascularity, or life span. Wave emergence was more synchronous (i.e. smaller variance) after cetrorelix treatment than Control (P=0.01). In Experiment 2, heifers remain untreated (Control) or treated im with a single 3 mg dose of cetrorelix on Days 1, 3, or 6 (n=8 per group), then given prostaglandinF2α 9 days after treatment and inseminated. Wave emergence occurred synchronously 3.6 ± 0.3 days after cetrorelix treatment and pregnancy rates did not differ. In conclusion, our results supported the hypotheses. Both single and multiple treatment with Cetrorelix caused regression of the dominant follicles, independent of their functional status, resulting in a synchronous emergence of the next follicular wave at a consistent time post-treatment. Cetrorelix treatment is an effective method to synchronize wave emergence and ovulation for reproductive management in cattle.

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Multimodal Imaging Insights on T Cell Localization in Cyclic Corpus Luteum of Buffalo via Immunohistochemistry and Electron Microscopy

Kapoor K., Singh O., Pathak D.

Department of Veterinary Anatomy, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab, India

The present research was designed to analyze localization of immune cells in cyclic corpus luteum (CL) by mapping immune-expression pattern and ultrastructural localization of T cells, during its formation and regression. CL were collected from healthy buffaloes (n=40); classified based on gross morphology into early (1-5 days, stage I), mid (6-11 days, stage II), late luteal (12-16 days, stage III) and follicular (17-20 days, stage IV) phases. For immunohistochemistry, tissue sections were incubated with primary antibody (Anti-$CD3^+$) followed by universal secondary antibody. For high-resolution surface morphology of T cells, scanning electron microscopy (SEM) was conducted on fresh tissues (n=24) fixed in Karnovsky's fixative for 8-12 hours and secondary fixation in 2% Osmium tetraoxide. In stage I, $CD3^+$ T cells were distributed randomly within parenchyma at periphery and concentrated in groups towards central cavity with average number 8.62 ± 0.9 (Mean ± S.E) per unit area. In stage II, these cells were occasional in parenchyma with average number not significantly different from stage I. The number of $CD3^+$ T cells in stage III increased considerably to 46 ± 2.6 per unit area, distributed throughout the parenchyma. Most of them were near septa, within and adjacent to capillaries. The stage IV was also characterized by their increased infiltration with no significant difference between stage III and IV. They were localized as aggregates within degenerating areas in this phase of regression. Under SEM, the lymphocytes observed were primarily T cells in this stage, either present singly or groups, typically characterized as small round cells, smooth in appearance with slightly irregular surface. The lower presence of $CD3^+$T cells during early CL stages indicated its probable role in apoptosis inhibition to promote luteal proliferation and their augmented immuno-expression in later stages indicated an inflammatory environment that further led to infiltration of macrophages for structural and functional luteal regression.

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A Comparative Study on the Lipid Profiles of Goat Oocytes During Summer and Winter

Kaur D.[1], Pathak D.[1], Singh N.[2], Singh O.[1], Uppal V.[1], and Singh J.[2]

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Lipid droplets are considered crucial reservoirs of cellular energy, supplying the necessary power to support various cellular functions. The current study aimed to study the lipid profile of goat oocytes during summer and winter. Goat ovaries, collected from a local abattoir, were washed, transported in a thermos at 30–35°C, and oocytes aspirated using an 18-gauge needle with a syringe containing 1 mL dPBS. The COCs were graded, stained with Oil Red O for lipid droplets, mounted, examined under a bright-field microscope, and photomicrographs analyzed using ImageJ software for lipid droplet counting. In the summer, 278 oocytes were recovered; the A, B, C, and D grade oocytes were 88, 55, 80, and 55, respectively. In the winter season, 293 oocytes were recovered; the A, B, C, and D grade oocytes were 62, 54, 72, and 105, respectively. Four patterns were observed for lipid distribution : uniform, peripheral, central, and unipolar. The percentages of uniform, peripheral, central, and unipolar were 49.6, 20.86, 26.97, and 2.51 during the summer season. The percentages of uniform, peripheral, central, and unipolar patterns observed were 54.6, 24.5, 16.7, and 4.09, respectively, during the summer season. Unipolar lipid droplet distribution pattern was observed in C and D-grade oocytes only. The total number of lipid droplets ranged from 2779 to 4595 per oocyte. Less than 1 µm lipid droplets were the predominant type, followed by 1-3µm and > three µm-sized droplets. During both seasons, less than 1µm lipid droplets were significantly higher than >3 µm-sized droplets. There was a seasonal shift in lipid droplets of less than 1µm size, and significantly higher lipid droplets were found in the winter compared to the summer ($P<0.05$). However, the total number of lipid droplets did not vary during the two seasons.

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From Macrophage Diversity to Neutrophil Dysregulation: Decoding Respiratory Disease Mechanisms in Water Buffalo

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Water buffalo is vital to India's rural economy and health. Further, Water buffalo is a hardy animal but collapses very rapidly to acute lung inflammatory conditions induced by infection with *P. multocida* highlighting the need for deeper understanding cellular landscape of lung inflammation in water buffalo during respiratory Infection. We first reported the presence of pulmonary intravascular macrophages in the water buffalo. Interestingly, antibody specific for CD68, which reacts with septal macrophages of cattle did not recognize these cells. Instead, MCA874G, which recognizes an intracytoplasmic protein in macrophages, labelled septal macrophages suggesting cellular diversity of buffalo. Depletion of macrophages with gadolinium chloride (GC) increased the mRNA expression of pro-inflammatory cytokines (TNF-α, IL-1β and IL-8) and pre-treated by GC followed by *P. multocida* challenge decreased proinflammatory cytokines in buffalo calves. There was increased numbers of monocytes/macrophages with the relatively low number of neutrophils in the alveolar septa of the inflamed lungs during *P. multocida* induced acute lung inflammation suggesting to explore neutrophils dynamics during common bacterial infections in the water buffalo.

We first reported data on the viability and apoptotic potential of neutrophils of water buffalo The freshly isolated neutrophils showed a purity of 98.4% with viability up to 98.44 ± 0.35%. There was a significant decrease ($p<0.05$) in the number of viable neutrophils after 24 hr, 48 hr and 72 hr post-incubation. LPS challenge resulted a significant decrease in the number of apoptotic neutrophils compared to control group at different time intervals. Further, viability of the neutrophils showed prolonged maintenance during mastitis and metritis positive water buffalo. The delayed apoptosis of neutrophils associated with mastitis and metritis suggests the activation of neutrophils by these pro-inflammatory conditions. These findings emphasize the importance of understanding dynamics of immune cells such as macrophages and neutrophil to develop effective strategies for managing bacterial infections in buffalo and improving herd health and productivity.

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Investigating the role of Inhibitory Factor-1 (IF1) in ozone-induced lung inflammation

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ATP Synthase Inhibitory Factory 1 (IF1) is a protein known to inhibit the hydrolyzing activity of the mitochondrial ATP Synthase (ATPSV). Lung inflammation leads to the accumulation of neutrophils, shown to express ATPSV on the plasma membrane. The role of IF1 and the mechanism of neutrophil recruitment in O_3-induced lung inflammation are not fully understood. To study the interaction of the ATPSV β subunit with IF1, we used an IF1 mimetic BTB06584 and performed a DARTS assay. We proceeded to study the role of IF1 in neutrophil migration using a neutrophil-specific IF1 knockout (KO) mice model, developed using the Cre-LoxP system. We imaged the neutrophil migration in vivo using the lung intravital imaging and in vitro by chemotaxis assay. The results from the DARTs assay revealed that ATPSV β subunit is protected from proteolytic degradation and BTB induces the degradation of ATPSV β subunit in a concentration-dependent manner ($p<0.01$). We further studied the effect of BTB on neutrophil migration and we found that BTB increases neutrophil migration by 2 folds in a dose-dependent manner ($p<0.01$). Further, we have developed knockout mice using Myeloid Related Protein (*MRP8) Cre-IF1Lox* technology to understand the role of IF1 in neutrophil activation and migration using lung intravital imaging and neutrophil chemotaxis assays. We also observed a 2-fold increase in neutrophils in the lungs exposed to the ozone as compared to the non-exposed in wild-type C57BL/6J and IF1 floxed mice. We are currently validating our knockout mice and will be ready to perform the lung intravital imaging in KO mice to study the activation and migration of neutrophils. We conclude that BTB protects the β subunit from proteolytic degradation and increases the migration of the bone marrow neutrophils. We are currently ready with our knockout mice that will be used for further intravital and chemotaxis experiments.

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Funding: NSERC Discovery; CGPS 75th Recruitment Scholarship; SACS Tuition Scholarship.

Trabecular pruning: A suggested mechanism of bone functional adaptation in young mammals, trading trabecular quantity for quality.

Barak M.M.

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Synaptic pruning in neural development of mammals involves the elimination of unnecessary neurons and synapses to optimize brain function and enhance neural transmission efficiency. The suggested concept of trabecular pruning draws a compelling parallel between neural and skeletal development in mammals. Like synaptic pruning, trabecular pruning describes a selective elimination process occurring in mammalian skeletal development between juvenile and reproductive stages (after an initial in-utero gestational overproduction). During this process, minimally loaded trabeculae are resorbed through bone modeling, potentially optimizing the skeletal structure's capability to transmit forces from articular surfaces to cortical regions. The trabecular pruning hypothesis proposes a developmental shift from modifying bone "quantity" to refining bone "quality." Initially, changes in bone volume fraction (BV/TV), trabecular thickness (Tb.Th), and trabecular number (Tb.N) predominate. Later stages focus on quality optimization through reorganization of remaining trabeculae, evidenced by changes in degree of anisotropy (DA) and principal trabecular orientation with minimal BV/TV alterations. Literature review supports this hypothesis in altricial mammals (but not precocial mammals), showing marked BV/TV changes during juvenile stages followed by stability, while more pronounced changes in anisotropy occur during later development until reproductive age. This framework offers a fresh perspective on bone functional adaptation, potentially bridging our understanding between initial rapid bone growth and subsequent refined skeletal structuring.

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Anatomy of the giraffe foot

Wilhite R.

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The distal thoracic and pelvic limbs of six giraffes, 3 male and 3 female were examined in order to characterize the normal anatomical structure of the giraffe foot. Bones, joints, blood vessels, nerves, tendons and ligaments in the distal limb (just above the fetlock down) were dissected and described in detail to better understand the function of the giraffe distal limb. The right distal limbs of each giraffe were dissected and the hoof capsules removed manually while the left limbs were sagittally sectioned, described and photographed. Sagittal sections were made through the center of both the third and 4th digit as well as though the interdigital space. A vast network of large veins lies on the palmar\plantar surface of the metacarpus\metatarsus was identified which provides extensive venous drainage from the foot. The distal interdigital ligament is very prominent and is continuous with the distal digital annular ligament. Arterial blood supply to the foot is primarily from the palmar surface of the metacarpus and from the dorsal surface of the metatarsus. One significant anatomical finding was the presence of a well developed heal bulb with both fibrocartilaginous and adipose components as well as a relatively thin but extensive digital cushion consisting of cells of adipose tissue divided by vertical lamellae of dense connective tissue. Continued study of the soft tissue anatomy of the giraffe foot will hopefully lead to a better understanding of the vital structure and better maintenance of the feet in captive giraffe.

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Pedagogy of Fairness in Teaching Anatomy

Hafez S.

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The Pedagogy of Fairness is a framework for teaching anatomy that emphasizes providing equitable learning opportunities and clear expectations for students while following evidence-based practices. Instructional practices are guided by the question, “Is it fair?” The author developed the Pedagogy of Fairness Framework based on the principles of Assessment Drives Learning, Biggs' Constructive Alignment, and Cognitive Load Theory, and the interactions among these educational ideologies. This framework encourages rethinking common instructional practices through a new perspective, specifically, “is it fair and equitable,” while assessing their effectiveness by comparing them with less common ones. Various evidence-based instructional practices are discussed and evaluated from the perspective of fairness. These include SMART objectives, selecting teaching methods that fit the purpose, and align with assessment strategies.

The importance of selecting teaching methods that fit the purpose was highlighted during the COVID-19 pandemic, particularly after shifting from face-to-face instruction to remote teaching. This study aimed to capture the immediate emotional reactions of veterinary students during this transition. Participants primary challenge was the lack of hands-on experience and the associated concerns regarding anatomy learning. It was “impossible” to replicate lab activities that require tactile engagement. Cadaver dissection remains the gold standard for anatomy education, and its extensive benefits may not be fully captured in any study. The lack of hands-on anatomy sessions deprived students of an “authentic learning” experience. Reflecting on the lessons learned from the pandemic can help shape future veterinary and medical education strategies and influence educational policies during other crises.

The Pedagogy of Fairness framework can serve as a guide for curricular development and reform. It is designed to maximize learning by outlining the best teaching practices rooted in the principles of fairness. This framework does not contradict evidence-based practices but augments the appreciation of their effectiveness.

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Prompts for success: Use of structured questions to enhance self-regulated learning and promote metacognition of first-year veterinary students in a veterinary anatomy course

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Self-regulated learning (SRL) can be divided into four phases: planning, learning, assessment and adjustment (White *et al.,* 2014). To enhance first-year veterinary students' use of the SRL cycle, we implemented structured questions during the 2024 Fundamental Principles of Veterinary Anatomy (FPVA) course, which includes weekly dissection laboratories of canine cadavers. Prior to each week's laboratory, students wrote responses to three questions to plan and set goals for the dissection. During the laboratories, students engaged in both the learning and assessment portions of the SRL cycle, obtaining self-assessment and external formative feedback from peers and instructors. After the dissection laboratory, students wrote responses to four prompts to reflect and make plans to adjust and improve in future laboratories.

Metacognition includes the ability of learners to plan, monitor and reflect upon one's own learning (Ruth and Dzara, 2024). The Metacognitive Awareness Inventory (MAI) is a 52-item inventory, which evaluates both knowledge about cognition and regulation of cognition (Schraw and Dennison, 1994). To evaluate for changes in metacognitive awareness, all first-year veterinary students completed the MAI at the beginning and end of the FPVA course. Positive changes in students' metacognitive awareness, particularly in the comprehension monitoring component of regulation of cognition, were detected.

This pilot study demonstrated that structured questions can be successfully used to promote student use of the planning and adjustment steps of the SRL cycle. Furthermore, the MAI can be used to detect improvement in students' metacognitive awareness after one semester completing these questions. This approach can be applied across a range of educational courses and settings. Moreover, the SRL cycle provides an important framework for our students to use as lifelong learners, and is widely applicable not only in school, but also to their professional endeavors as veterinarians.

References:

Ruth A.A. and Dzara K. (2025) Incorporating structured metacognitive training into an undergraduate anatomy classroom. Anatomical Sciences Education, 18(1):87-96. doi: 10.1002/ase.2537.

Schraw, G. and Dennison, R.S. (1994). Assessing metacognitive awareness. *Contemporary Educational Psychology, 19*(4), 460–475. doi.org/10.1006/ceps.1994.1033.

White, C.B., Gruppen, L.D. and Fantoe, J.C. (2014) 'Self-regulated learning in medical education' in Swanwick, T. (ed) *Understanding Medical Education*, 2nd edition. Chichester: Wiley, 201-211.

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A Comparative Study of Cadaveric Canine Anatomy Learning Modalities for Novice and Intermediate Learners

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Use of formalin embalmed cadavers is no longer an option for professional education at this institution. This study evaluated four canine cadaveric model types (formalin embalmed, ethanol-solution embalmed, frozen-thawed non-embalmed cadavers, and plastinated specimens) to compare anatomical fidelity and assess educational outcomes. Sixteen students were distributed into 4 groups for the 4 cadaver types, with each group consisting of one of 4 student types (Novice, Human Prosection, Animal Prosection, Animal Dissection). Each day consisted of two sessions with Day 1 using prosected specimens of the 4 specimen types (AM: thoracic limb, PM: Head) and Day 2 dissection (AM: Abdomen, PM: Pelvic) with students in the plastinated group redistributed to the other 3 model types. For each session, students had a mini-lecture with 1.5 hours to study (Day 1) or dissect (Day 2), followed by a table check to ensure knowledge of their cadaver, a 15-minute rotation to view all cadaver types, and 30 minutes of additional study before an exam was administered using all cadaver types. Data collection has been completed. Initial 2-factor ANOVA for assessment outcomes have been completed. Additional analysis using ANOVA for repeated measures ongoing to include learner level, specimen type, and question type (ie. first-order, second order, comparative. The 2-factor ANOVA indicated no significant differences between cadaver models in student performance on table checks or lab exams, as well as in self-reported or staff-assessed confidence. Novice students performed significantly worse than the other three student types, highlighting the importance of prior anatomy lab experience. While all cadaver models demonstrated comparable educational value in terms of learning outcomes, qualitative observations revealed practical challenges with ethanol-embalmed and fresh cadavers, including unpleasant odors and rapid decomposition, limiting their long-term usability. Future study will include qualitative analysis of participant surveys to inform the user experience.

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Optimizing the Preparation of Osteological Specimens for Education, Research, and Display

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The preparation of osteological specimens—through soft tissue removal, maceration, degreasing, and whitening—is fundamental for anatomical education, research, and museum display. However, the quality of the final specimen heavily depends on the techniques used during these steps.

Modern maceration techniques aim to remove soft tissues while preserving some collagen. High-temperature boiling, once common, can irreversibly damage delicate structures such as nasal turbinates and thin ribs. Enzyme-based maceration allows tissue breakdown at lower temperatures, preserving fine anatomical detail. Maintaining a stable pH during the process is critical, as enzyme activity is pH-dependent and can be compromised by the acidification that results from protein decomposition and fat oxidation.

Effective degreasing is essential to prevent long-term degradation. Residual lipids oxidize over time, forming fatty acids that compromise bone integrity and result in brittle, porous specimens. While several degreasing methods exist, those involving organic solvents and mechanical systems are the most effective.

In research and museum contexts, some bones may be only partially cleaned to preserve DNA for future molecular analysis. For educational and display purposes, protective impregnation of the cleaned bones is recommended to safeguard against dirt and handling.

Despite its importance, skeletal preparation remains an often-overlooked aspect of anatomical work. Inadequate methods result in greasy, unstable, and odorous specimens. Applying modern, evidence-based techniques produces clean, durable, and high-quality osteological specimens suitable for long-term use in teaching and research.

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Introduction of a remediation process to support student learning in veterinary anatomy

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The veterinary curriculum is challenging, and individual students sometimes need additional opportunities to assimilate content. Accordingly, we developed and implemented a structured remediation process for veterinary gross anatomy to support student learning by promoting content mastery, encouraging self-reflective learning strategies, and mitigating academic stress. This formal remediation process, called *Upgrade*, occurs during the semester and provides a structure for students to further engage with the content and have a second chance to demonstrate mastery. Students are eligible for remediation any time they score below 70% on a unit lab practical exam; there are four such exams in the fall and three in the spring, and students must achieve a score ≥70% to pass the course each semester. The remediation process has two levels depending on the student's exam score: 1) students scoring 65–69.99% complete annotations of incorrect exam questions, and 2) students scoring <65% complete exam annotations, meet individually with one of the course coordinators, and take an online exam on content specific to the unit. Students who successfully complete the process have their exam score amended to a 70% (or the higher of the two exam scores, if they take the online exam but score <70%). This process was implemented in Fall 2023, and students were surveyed at the end of the academic year. Students who remediated an exam found the process to be helpful, not only for raising their grades but also for enhancing their learning. Most survey respondents did not need to remediate an exam but still perceived benefits from knowing the option was available, describing lower stress levels, a more conducive learning environment, and feeling supported in the class as positive aspects.

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Lab-grown testis: A novel tool for the assessment of testis organogenesis.

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The compartmentalized structure of the testis tissue is key for the complex dual functions of spermatogenesis and steroidogenesis, but it also presents challenges in replicating the form and function of testis tissue *ex situ*. An optimized testis organoid (artificial testis) may provide an accessible tool for the study and manipulation of testis tissue.

We have established a scaffold-free culture system in which neonatal testis cells from piglets are fully capable of self-reassembly into stable testis organoids consisting of tubular and interstitial compartments. These testis organoids have biomimetic architecture and endocrine functions with striking similarity to the native testis tissue. This includes the presence of all major cell types and structural details expected in normal testis tissue such as germ cells and Sertoli cells within the cords and Leydig cells and even vascular structures in the interstitium.

Importantly, Sertoli cells gradually underwent maturational changes by showing increased expression of androgen receptors, decreased expression of the anti-müllerian hormone, and formation of the blood-testis barrier. The organoids also respond to LH stimulation by releasing testosterone. As such, testis organoids provide a robust, tunable system for diverse basic and applied applications. These applications include research into *de novo* testis organogenesis, pathological mechanisms of its mal-development, experimental manipulation of testis form and function, testing of various potential toxicants on testis formation, and induction of *in vitro* spermatogenesis for genetic preservation or restoration of male fertility.

Therefore, testis organoids provide a promising *in vitro* platform for the study and manipulation of testis morphogenesis, somatic cell maturation, and endocrine production.

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Neuroanatomical sexual dimorphism of GnRH and kisspeptin systems in South American camelids

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Gonadotropin-releasing hormone (GnRH) and Kisspeptin are two key neuropeptides mediating reproductive function, and their sexually dimorphic expression is well established in several species. However, the neuroanatomical variations remain largely unexplored in South American camelids. This study investigates the hypothalamic distribution and sexual dimorphism of GnRH and Kisspeptin systems in adult alpacas (*Vicugna pacos*), an induced ovulator. Male and female alpacas (n = 4/sex) were euthanized by an overdose of pentobarbital and the brains were perfused with 4% paraformaldehyde. Hypothalamic sections were double stained using double sequential immunohistochemistry for Kisspeptin and GnRH. Using light microscopy, hypothalamic regions including the medial septum/diagonal band of Broca, preoptic area (POA), anterior hypothalamic area (AHA), and mediobasal hypothalamus (MBH) were examined. Neuronal distribution and axonal appositions between GnRH and Kisspeptin were manually quantified using light microscopy at 20x and 100x magnifications. Data were compared using t tests or two-way anova and significance was taken when $P<0.05$. Results revealed no significant differences in the total number of GnRH neurons between males and females across all regions examined. Kisspeptin neurons were predominantly localized in the MBH of both sexes with smaller populations in the POA and AHA. The total number of Kisspeptin neurons was not statistically different between sexes, however, the number of Kisspeptin neurons per section tended to be higher in female alpacas, compared to males (55.5 ±10.3 vs 25.3 ±8.1; $P=0.08$). A higher proportion of GnRH neurons receiving Kisspeptin inputs in females compared to males was observed in the MBH region (67.5% ± 3.2 vs 42.2% ± 2.0; $P<0.05$), but this was not reflected in the number of inputs per GnRH neuron. Results support the view that the association of GnRH and kisspeptin neurons display sexual dimorphism in South American camelids, however, whether this observation mediates physiological events such as induced ovulation remains unknown.

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Molecular imaging of oxidative stress-induced acute lung inflammation using ^{89}Zr-labeled angiostatin

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Angiostatin (ANG) is an endogenously cleaved protein of plasminogen-plasmin which is activated during tumor angiogenesis and acute inflammatory conditions such as acute lung injury (ALI). We hypothesized that radiolabeled neutrophil elastase-derived ANG (^{89}Zr-ANG) will selectively bind under oxidative stress-induced lung inflammation. Pharmacokinetic evaluation was performed through 3-day sequential microPET/CT in a combined ozone and LPS induced murine acute lung inflammation model, followed by whole-body and fractionated blood biodistribution studies. Data analysis also accounted for differential sex-based biodistribution of ^{89}Zr tagged angiostatin. Standard uptake ratio (SUR) of ^{89}Zr-ANG in lungs was 4.8-8.5 and 4.2-11.6-fold higher in male and female mice, until 72 h after ozone and LPS treatment when compared with sham mice ($p<0.0001$). The biodistribution data revealed accumulation of angiostatin in platelets and multiple organs in addition to lungs of the ozone and LPS treated mice. We also tested the prognostic significance of ^{89}Zr labeled angiostatin against an established inflammation marker ^{68}Ga-citrate, using PET/CT in in the murine ALI model. Lung ^{68}Ga-citrate peaked at 48 h after treatment due to vascular permeability. Fluorescent dye (CF-488) labeled angiostatin was injected along with ^{68}Ga-citrate to confirm the earlier observation of ^{89}Zr-ANG concentration in platelets. Results indicated that activated platelets (both ex-vivo and in-vitro) preferentially bind angiostatin compared to untreated platelets. Thus, the current study supports the use of ^{89}Zr-ANG as a PET tracer for imaging platelet activation in murine ALI. Preliminary data from pig platelets confirm the murine angiostatin binding pattern. Future studies in porcine ALI model will help translate the findings from mouse experiments to humans.

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Uterine Smooth Muscle Cell Adaptation to Mechanical Stretch Mediated by Stress Proteins

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The myometrium, or uterine muscle, undergoes cellular adaptation during pregnancy to enable the future production of labour contractions and delivery of a baby. Fetal growth induced uterine stretch increases detection of small Heat Shock Protein Beta 1 (HSPB1) in the myometrium during pregnancy, particularly serine phosphorylated forms of HSPB1. However, the precise responses of phosphorylated forms of HSPB1 and their specific cellular locations in myometrial cells following tension are unknown. We hypothesized that increased tension applied to myometrial cells will increase the detection of serine phosphorylated forms of HSPB1 and that cellular locations of these proteins will be altered with tension over time.

An immortalized myometrial cell line was seeded on collagen I-coated flexible bottom 6-well plates and cultured in DMEM/F12 media containing 10% FBS and antibiotics. A Flexcell FX-6000T system was used to induce different unrestrained tensions (0, 10, 15, 20, 25% elongation) on myometrial cells, followed by lysis in RIPA buffer, SDS-PAGE, and detection of phosphorylated forms of HSPB1 by immunoblot analyses. For time course experiments following elongation at 25%, cells were immediately fixed in 4% paraformaldehyde/phosphate buffered saline (PBS), permeabilized with PBS containing 0.1% Triton X-100, then immunostained for specific forms of phosphorylated HSPB1.

For experiments with different tensions, immunoblot analyses demonstrated that phosphoserine-15-HSPB1 (pS15-HSPB1) and pS78-HSPB1 were significantly elevated at 25% elongation relative to 20%, 15%, 10%, and 0%. In contrast, pS82-HSPB1 detection was only significantly elevated at 25% elongation relative to 10% and 0%. Over a time course of 25% cell elongation, immunofluorescence detection of pS78-HSPB1 was markedly diminished in focal adhesions at actin stress fibre termini, compared to pS15-HSPB1, while pS82-HSPB1 remained in perinuclear locations.

Our results indicate that pS15-HSPB1, pS78-HSPB1, and pS82-HSPB1 may have distinctive roles within myometrial cells exposed to tension stress.

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Evaluating Utilization of Supplemental First Year Veterinary Anatomy Learning Resources

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This project examined the current supplemental learning resources offered to the students by the University of Minnesota for studying anatomy. Surveys were created and administered to all current first through fourth year DVM students, Classes of 2025 through 2028, who were currently enrolled in anatomy 1 or had completed anatomy 1 at the University of Minnesota. All surveys administered were completed voluntarily and anonymously by the students. The purpose of this research was to evaluate if students are using the supplemental resources offered, if students found the supplemental resources helpful and if usage of the supplemental resources has any bearing on examination performance. The most common time spent studying for an anatomy dissection practical exam was 10-15 hours for the Classes of 2026-2028. 5-10 hours was the most common time studying for the Class of 2025. The most utilized supplemental resource was the Dissection Pre-Lab videos and the least utilized was the Textbook of Veterinary Anatomy. The majority of students claimed to either strongly agree or agree that each supplemental resource offered increased their knowledge or skill for dissection exams. Since the COVID pandemic, there was a lot of thought put into ways the traditional in-person learning could be supplemented for courses that are highly dependent on hands-on activities like Gross Anatomy. As a result, instructors came up with various supplemental resources to aid student learning. This project produced valuable information regarding how students are studying for the course and the feedback received can be implemented to improve the Anatomy 1 course for future cohorts. This feedback could also be utilized in other veterinary schools' gross anatomy curriculum.

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Assessing the Integration of Virtual Dissection Tables into Veterinary Anatomy Curricula: A Pilot Study

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Virtual Dissection Tables (VDTs) are becoming an increasingly available resource in human anatomy education, providing interactive 3D-models to complement traditional cadaver-based learning. In contrast, their implementation in veterinary anatomy education is still in its early stages, with only a limited number of systems currently in use.

To evaluate the educational value of a veterinary-specific VDT (Anatomage TableVet®), two instructional approaches were implemented: (1) a structured 12-hour elective course, and (2) optional self-directed access for first-semester veterinary students. The elective course (1) combined high-resolution 3D-models with conventional dissection, supported by worksheets and quizzes in small-group settings. For (2), students received independent access to the full range of VDT-functions following a brief instruction.

In (1), a self-assessment survey was conducted to evaluate the advantages and limitations of the VDT. Due to strong interest in autonomous use, a follow-up survey to (2) investigated the usage-frequency and the reasons for (non-)engagement.

Evaluation of (1) revealed inadequate anatomical labeling and a limited availability of well-segmented specimens. Despite these constraints, four of six instructors and all participating students (n=12) rated the VDT as a valuable supplement to anatomical education. Moreover, 74% of students reported an improvement of their topographical understanding. Regarding (2), 30.3% of first-semester students (n=130) utilized the VDT independently. The primary factor stated for non-usage was ‘lack of time’ (86.8%). Other potential deterrents, such as technical difficulties or perceived lack of educational benefit, were negligible (2.4% and 0%, respectively). Students recommended the veterinary VDT with an average Net Promoter-Score of 7.5 (scale: 1 = not at all, 10 = highly recommend).

In conclusion, the VDT increased digitalization and promoted student motivation, representing a valuable complement to anatomical teaching, particularly in a supervised learning-environment. A crossover study comparing learning outcomes between the VDT and traditional cadaver-based dissection is planned for the upcoming academic term. (299/300)

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CONFERENCE ABSTRACTS

Posters

Improving student spatial and anatomical understanding of the larynx using 3D printed equine larynges

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Three-dimensional (3D) printed anatomical structures have the capacity to be an effective supplementary tool for anatomy learning. The objective of this project was to create a durable 3D printed laryngeal cartilage model and determine students' perceptions of the model's benefit as a learning tool.

In 2023, a computed tomography (CT) scan of an equine larynx and hyoid apparatus were exported using Materialise Mimics, modeled in Meshmixer, sliced in Lychee Slicer, and printed on a Creality Halot Mage 3D printer using Siraya Tech flexible and fast resin. After confirmation of anatomical accuracy, the volumized model went through 18 iterations in Meshmixer to develop intrinsic articulating attachment points between cartilages and extrinsic articulations to the hyoid apparatus. In 2024, models were provided to undergraduate (prosection, n=80) and graduate (dissection, n=21) anatomy students at Colorado State University, and the veterinary anatomy dissection students (n=33) at Oregon State University. At the end of the respective courses, all students (N=132) were asked to rank the helpfulness of the model compared to traditional teaching instruments using a 7-point Likert scale (1: not helpful; 7: very helpful). Mean ± standard deviation are reported with significance ($P< 0.05$) following t-test analysis. Open-end responses were collected but not analyzed for the purpose of this report.

Overall, students did not consider the models to be more helpful (4.35 ± 1.54) than traditional teaching instruments. Students who engaged in dissection (N=54) reported the model to be significantly more useful (5.26 ±1.23) as compared to the students who were in a prosection course only (4.03 ±1.54). It is unclear from this study what the role of teaching methods or experience with anatomy (ie. overall time in course) are for students' perceptions of models. Future research will include quantitative and qualitative analyses of student learning outcomes and will address these populations differences.

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Funding: This work has been supported by Colorado State University's Virtual Veterinary Educational Tools program.

Examination of the luminal distensibility of the canine esophagus at three potential points for obstruction

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The canine esophagus has several anatomical sites where swallowed objects, such as toys or other foreign objects, can become entrapped and cause an obstruction. These obstructions can be the cause of veterinary visits and be life-threatening. The goal of this study was to characterize the distensibility of the esophagus at three known obstruction points—cranial esophageal sphincter, thoracic inlet, and caudal esophageal sphincter—in relation to the maximum distension of the esophagus immediately orad to these obstruction points. This approach enables analysis of size and shape of the distended esophagus, and the effect of surrounding anatomical structures on the degree of distension. Using donated canine cadavers, ranging from mesocephalic to mildly brachycephalic (average±SD cephalic index [CI] = 61±4.5, CI range: mesocephalic 50-60, brachycephalic >60), the study included 10 canids sorted into 5 weight categories (*N*=2 per category: 5-15, 15-30, 30-45, 45-60, 60-80 lbs), with a target body condition score of 5/9. Orogastric balloon catheters were placed into the stomach and retracted orad to span each obstruction point, then inflated to 60 mmHg for Computed Tomographic (CT) imaging. Anatomical measurements were obtained from CTs using PACS software. At each obstruction point multiple measures (diameter [mm], area [mm^2]) of the two-dimensional distended lumen were obtained, and in several different planes (dorsal, transverse, and sagittal) to capture the dimensions and the distensibility of the obstruction point in relationship to the level of maximum distention. The measurement methodology was validated by comparing repeated measurements between an anatomist (LF) and a radiologist (LD), with intra- and inter-individual coefficients of variation of 0.9% and 7.70%, respectively. By characterizing esophageal distension at these obstruction points, this study aims to contribute to a canine model of the proximal orogastric path that can be used in dog toy safety and design.

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Potential *in vitro* effects of vaping on formation of testis tissue.

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Vaping has been rising in popularity in recent years, especially among teenagers. E-cigarettes are marketed as a safer alternative to smoking and even used by some pregnant women as a smoking cessation aid. However, limited research has been conducted on chemical profile, long term effects, or their potential effect of vaping on a developing fetus if used by an expecting mother.

Our laboratory has pioneered the development of testis organoids (aka 'artificial testis') from dissociated neonatal testis cells. These organoids contain all cellular and structural components of testis tissue and resemble intact testis.

We set out to study the effect of vaping on testis organogenesis using the pig testis organoid model. We exposed the organoids to vaping for 3 weeks using a novel system to bubble the culture media with vape smoke (with and without nicotine), prior to feeding the organoids. The vaping-exposed media was either used without dilution (1x) or after diluting 10x, while the control media was bubbled with filtered air. Organoids were sampled after 1 or 3 weeks and analyzed for proper testis cord formation and quantification of apoptotic and germ cells as well as inflammatory cytokines.

The results showed no differences in testis cord formation or germ cell numbers among all groups ($P>0.05$). However, after 1 week of culture, there were increased numbers of apoptotic cells among the 1x dilution vaping groups (with and without nicotine), compared to both the respective 10x dilution groups and negative controls ($P<0.05$). Most apoptotic cells were found in the interstitium suggesting possible Leydig cell death. The levels of IL-1ir (an inflammatory cytokine) were also higher in the nicotine-vape treated organoids. Further research is needed to investigate the potential effects of vaping on testosterone secretion, testicular cytokine production, and inflammation in organoids; nevertheless, these results provide a promising starting point.

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Funding: Natural Sciences and Engineering Research Council (NSERC) of Canada.

Single-Cell RNA sequencing reveals the transcriptomic landscape of testes in Sertoli cell Connexin 43-deficient and wild type mice

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Spermatogenesis, the complex process of sperm formation and maturation, is tightly regulated and requires precise coordination between various cellular players, particularly somatic Sertoli cells. These cells within the seminiferous epithelium are crucial in controlling germ cell proliferation, migration, and differentiation. Connexin 43 (Cx43), a gap junction protein expressed in Sertoli and germ cells, plays e.g. an essential role in maintaining the blood-testis-barrier (BTB), a critical structure that ensures proper testicular function. The loss of Cx43 in Sertoli cells leads to disruptions in spermatogenesis, ultimately resulting in infertility. This study aimed to investigate the role of Cx43 in spermatogenesis using an innovative single-cell RNA sequencing (scRNA-seq) approach. To achieve this, adult Sertoli-cell-specific Cx43 knockout (SCCx43KO) mice were examined and these results were compared to those of wild type (WT) littermates. By analyzing the entire testis, the study aimed to provide a comprehensive overview of the cellular and molecular changes occurring within the testis. Specifically, it investigated how the absence of Cx43 influences the gene expression profiles of various testicular cell populations, including Sertoli, germ, peritubular, and Leydig cells. The present analysis also provided insights into the impact of Cx43 deficiency on cellular heterogeneity and BTB-related components. Using marker genes like Lin28 for spermatogonial progenitor cells and Hsd3b1 for Leydig cells, distinct testis-specific cell clusters were identified, with individual cells traced back to their respective animals, even after pooling them for analysis. The results revealed significant differences in gene expression between SCCx43KO and WT mice, suggesting disruptions in intercellular communication and spermatogenesis due to Cx43 deletion. These findings enhance our understanding of the molecular mechanisms governing male fertility, underscore the critical role of Cx43 in maintaining testicular function and by profiling gene expression at the single-cell level, the study might further provide valuable new insights into the molecular causes of male infertility.

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Comparison of two chemical immobilization agents and the effect of antibiotics on bison semen

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Genetic isolation and disease (e.g., brucellosis and tuberculosis) threatens North American wild bison populations. Techniques to reliably collect and disinfect semen under field conditions will help species recovery. To test the potential effects of chemical immobilization agents on semen collection (Experiment 1), two different drug combinations were compared (medetomidine, zolazepam and tiletamine [MZT] vs thiofentanyl and xylazine [TX]). Semen was collected after immobilization of 4 wood bison bulls (4 collections per bull, n=16 collections). Spermiogram analyses of ejaculates show that semen motility, progress motility and sperm per ejaculate were significantly different in bison tranquilized with MZT than TX ($P<0.01$). For cattle, the National Association of Animal Breeders recommends the addition of 500 µg gentamicin, 100 µg tylosin, 300 µg lincomycin, and 600 µg spectinomycin in 20 µl per ml of raw semen. To determine the potential harmful effects of rising concentrations of antibiotics on sperm characteristics in bison (Experiment 2), semen was collected by electroejaculation of mature wood bison bulls (n=10) physically restrained in a hydraulic chute. Each ejaculate was divided into four aliquots, and antibiotics were added at the i) recommended dose, ii) twice the recommended dose, iii) four times the recommended dose, or iv) no antibiotics, immediately after collection. No difference among semen groups in overall sperm motility ($P=0.94$), progressive motility ($P=0.95$) or the proportion of morphologically normal sperm ($P=0.96$). Based on these findings, a combination of MZT was superior to TX as chemical immobilization agent to obtain a good quality ejaculate from bison collected under sedation, and there was no deleterious effect, dose-related or otherwise, of antibiotics on sperm quality in bison ejaculates.

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CD34 deficiency attenuates OVA-Induced pulmonary intravascular macrophage recruitment in both male and female mice

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Asthma is a chronic inflammatory airway disease associated with immune cell infiltration and airway hyper-responsiveness. CD34, a sialomucin cell surface glycoprotein expressed on hematopoietic, and progenitor cells, plays a role in immune cell trafficking. This study aimed to investigate the role of CD34 in pulmonary intravascular macrophage recruitment during OVA-induced allergic airway inflammation. Mice (28 days old) were divided into eight groups based on sex, genotype (wild type or CD34 knockout), and treatment (saline or OVA-treated). Both male and female groups included: a saline-treated wild-type control, an OVA-treated wild type, a saline-treated CD34-/-, and an OVA-treated CD34-/- group. Mice were sensitized intraperitoneally with OVA (2 µg/2 mg alum) or saline on days 1 and 15, followed by aerosol challenges with 1% OVA or saline on days 30, 32, and 34. Lung tissues were analyzed by immunohistochemistry using CD68, Mac387, and F4/80 markers to evaluate pulmonary intravascular macrophages. CD34-/- mice exhibited a marked reduction in the macrophage marker expression compared to wild-type controls following OVA exposure in both sexes. These results suggest that CD34 is essential for effective macrophage recruitment to the lungs during allergic inflammation. This study enhances our understanding of CD34's role in immune cell migration during asthma and highlights its potential as a therapeutic target.

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Using online learning to reinforce knowledge and skills necessary for vet students to perform neurological exams

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First year veterinary students struggle with understanding the nervous system and applying their knowledge in clinical contexts. There is no designated neuroanatomy course in the Texas A&M University College of Veterinary Medicine and Biomedical Sciences (CVMBS) curriculum and neuroanatomy content is distributed across multiple courses. To help students prepare for performing neurological exams on live patients, we developed a supplemental course to consolidate neuroanatomy content, allowing students to review material presented in lecture, quiz themselves on their knowledge, and to practice localizing neurological lesions in clinical scenarios. We provided this course, Nervous System Supplemental Instruction (NeuroSI), to the first-year veterinary students in the fall semester of 2024. We tracked their usage of the course and recorded exam scores from their final anatomy exam, which is the major exam covering neuroanatomy content. We used the previous years' exam scores (2023) as the control since they did not have access to NeuroSI. We are currently looking at this data, but we predict that students who used the NeuroSI course outperformed students from the previous year on localization questions on their final exam. We are also looking at within group usage data among the 2024 class and predict that students who reviewed the course multiple times and focused on localization practice performed better on the final exam than those who did not. We hope to develop study recommendations for subsequent years that will produce high exam scores and ultimately contribute to mastery of the neurological exam. We hope to demonstrate that providing a centralized resource helps students succeed in the absence of a designated course.

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Comparative Evaluation of Scrotal, Pre-scrotal and Caudal Abdominal Orchiectomy Approaches in Rabbits (*Oryctolagus Cuniculus*)

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Orchidectomy is a common procedure in rabbits, performed for both therapeutic and preventive purposes. Indications include behavioral issues (e.g., sexual activity, urine marking), prevention of breeding, and treatment of testicular conditions such as tumors, infections, trauma, or cryptorchidism. This study aimed to compare three surgical techniques; pre-scrotal, scrotal, and caudal abdominal, based on surgical preparation time, duration, suture usage, wound healing, and pain assessment.

Fifteen Nigerian local rabbits were randomly assigned into three groups (n = 5 each): Group A (pre-scrotal), Group B (scrotal), and Group C (caudal abdominal). Surgical preparation and procedure times were recorded. Wound evaluations were conducted at 8, 24, and 32 hours, and 7 days post-surgery. Pain assessments were done at 8 and 24 hours post-operatively.

The scrotal group had the longest preparation time, followed by the pre-scrotal group, with the abdominal group requiring the least. The abdominal group also used the least chromic catgut suture, although overall suture usage differences among groups were not statistically significant. No scrotal edema was observed at 8 hours in any group. However, significant differences in edema scores were noted at 24, 32 hours, and 7 days post-operatively. Pain scores showed no significant differences among groups at 8 and 24 hours.

The study concludes that the pre-scrotal approach is the most preferable technique for orchidectomy in rabbits, as it is associated with fewer post-surgical complications, reduced suture consumption, shorter preparation and surgery times, and lower pain levels. Nonetheless, all three techniques were found to be safe and effective for use in rabbits.

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Creation of a virtual canine skeleton (3D model), a primer for a virtual reality (VR) immersive experience.

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Veterinary gross anatomy training is essential for the clinical training of veterinary students. Studying anatomy requires a multifaceted approach, including cadaver-based dissection, live animal palpation, and textbook use. However, very few or almost no resources can effectively combine all these study tools in a single module. To bridge this gap, we tested a **hypothesis** that *creating a 3D model of a canine skeleton will serve as a foundational canine anatomy resource*.

First, the articulated canine skeleton was three-dimensionally (3D) scanned and used as a reference for accurately reconstructing each bone using primitive forms such as cubes and cylinders in ZBrush, a digital sculpting tool. The reconstructed bone models were then imported into Autodesk 3ds Max for further alignment and refinement. In addition to the original scans, biomedical illustrators and engineers collaborated with veterinary anatomists and consulted standard anatomical texts to ensure the model accurately represented the canine skeleton in a dynamic, animated format. The final model enabled individual bones and structures to be labeled, with the optional integration of muscle layers to enhance student-centered learning.

This project has provided Biomedical Art and Visualization students with training in constructing clinically relevant veterinary anatomy content. The project will continue as the reconstructed skeleton is integrated into a Unity-based Virtual Reality environment. This transition will enhance learning by allowing students to navigate around a life-size canine skeleton and manipulate individual bones in real time. The ultimate goal is to simulate an experience comparable to being in a clinical setting with a full-scale dog.

Our current results indicate that 3D scans from a canine skeleton, combined with digital reconstruction data, are sufficient to generate realistic 3D representations.

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Immunolocalization of Vimentin and PCNA in the uterine tube of Buffalo during summer and winter

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The present study was conducted to find variation in expression pattern of vimentin and proliferating cell nuclear antigen (PCNA) in uterine tube of buffalo (n=12) during summer and winter season. Tissue samples were collected from the slaughterhouse and Post-mortem Hall, GADVASU, Ludhiana during summer (mid-April to mid-July) and winter (mid-November to mid-February) season. Three of six samples were in the follicular and luteal phases, respectively. The immunohistochemical technique determined the localization and distribution of vimentin and PCNA in different uterine tube segments using a one-step polymer HRPO staining system. Vimentin was localized in the lamina propria, propria submucosa, tunica muscularis, and tunica serosa in all the parts of the uterine tube during both phases, in both seasons. The higher vimentin expression during winter may reflect increased tissue remodeling and structural reorganization, essential for reproductive function. Localization of PCNA was observed in nuclei of epithelial cells, infiltrating cells of lamina propria, muscle cells of tunica muscularis, and in a few connective tissue cells of tunica serosa in all the compartments of the uterine tube in both the phases during both summer and winter. No significant difference was seen in the number of PCNA-positive cells during the estrogenic stage in both seasons. In contrast, a highly significant difference ($p \leq 0.001$) was seen in the number of PCNA-positive cells during the luteal phase of summer and winter seasons. The PCNA-positive cells were significantly higher during the luteal phase of winter as compared to the luteal phase of summer in the uterine tube. Reduced PCNA activity during summer implies a lower cellular turnover or proliferation rate, which could cause a decline in reproductive activity during summer. The present study on the immunolocalization of these receptors in different parts of the uterine tube during summer and winter will help improve buffalo's reproductive efficiency.

Keywords: Immunohistochemistry, Vimentin, PCNA, Uterine tube, Buffalo, Summer, Winter

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Assessing Variation Significance in Select Vascular Patterns of the Canine Head

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Pattern variations in smaller vessels are less detailed in literature. Such descriptions may benefit imaging interpretation and surgical planning. Empirically, our students' dissections of canine head vessels have shown a higher variability than expected. This pilot study aimed to establish the statistical significance of these variations.

Twenty-one student-dissected, embalmed, and latex injected, hemi canine heads were examined for: terminals of the common carotid artery; affluence of the caudal auricular vein into the maxillary vein; and origin of the facial vein. Six categories of vascular variations were established and analyzed using Monte Carlo simulation-based Chi-square goodness-of-fit tests. Individual exact binomial tests were performed to assess the statistical significance of each variation category within its group.

The analysis indicated significant deviations in most categories. Both ventral and dorsal muscular arterial branches of the external carotid artery showed significant deviations (χ^2 = 51.76, p = 0.00008 and χ^2 = 184.01, p < 0.00001, respectively), especially for the presence of an arterial branch ascending into hypaxial muscles (9/21, p<0.00001). The origin of the ascending pharyngeal artery had a significant variability (χ^2 = 50.96, p = 0.00012), while that of the caudal auricular artery did not (χ^2 = 1.06, p = 0.776). Occurrences of caudal auricular and superficial temporal veins confluence into the maxillary vein were a significant deviation (χ^2 = 15.64, p = 0.0034). And, while no individual variant reached significance, overall variations in the origin and proximal affluents of the facial vein was established (χ^2 = 76.69, p = 0.00037).

Most of the vascular variations studied have shown statistical significance, and, in the case of the origin of the caudal auricular artery, a lower incidence compared to previous descriptions. This vascular heterogenicity of the canine head warrants a more extensive study and potential revision of anatomical descriptions.

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Learning Embryology in 3D by integrating Clay Modeling in Veterinary Anatomy Pedagogy: An Immersive Hapto-Visual Approach

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Embryology is an imaginary and descriptive part of veterinary anatomy for students. It becomes difficult to grasp when it is taught only through 2D diagrams or descriptions via power points. Clay modeling activity in embryology can be helpful in making complex three-dimensional (3D) developmental processes tangible and easier to visualize. The present study involved qualitative analysis of effectiveness of clay modeling adopted for teaching and learning veterinary embryology as hapto-visual approach among first year B.V.Sc. and A.H students (2023-24). This pedagogy involved learning embryology in 3D via hands-on approach by students that involved their tactile and visual senses, both. Two groups of students were curated (7 students in each), where group I studied embryology concepts with clay modeling as 3D approach and group II as control group that studied embryology with 2D diagrams through power-points. The outcome of learning experience by clay modeling activity shared by group I students as compared to group II recognized it as an engaging tool for better kinesthetic learning and retention of concepts. It enhanced deep learning in group I by shifting learning from pure memorization to step-by-step development of dynamic embryological processes by creating static but manipulable clay models themselves. This pedagogical tool thus, promoted active learning in the form of experiential learning of complex embryological process like formation of blastocyst, development of eye, tongue and brain by students, which they otherwise had to visualise through 2D diagrams or animations. It enhanced visual-spatial reasoning in group I as compared to group II due to their hands-on creative experience, thereby enhancing cognitive development. This group activity also proved to boost team-work among students, problem-solving, articulation of shared knowledge and thereby reinforcing self-learning through experience. It is further suggestive that it can be adopted as a part of veterinary embryology curriculum for enhanced student learning.

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Creation of a 3D animated model of the equine guttural pouch to enhance student learning

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Learning the anatomy of the equine guttural pouch presents a challenge for anatomy students and veterinary clinicians. Its intricate position within the head, close association with critical structures, and lack of homologous counterparts in commonly studied species contribute to difficulties in visualization and spatial understanding. Traditional two-dimensional diagrams often fail to illustrate the intricate three-dimensional (3D) spatial relationships of the region, resulting in gaps in anatomical comprehension. The incorporation of 3D animations and interactive models into veterinary education has demonstrated significant potential in overcoming similar learning challenges[1]. Therefore, we hypothesized that creating a 3D animation of the equine guttural pouches would enhance training for students and clinicians.

In a preliminary trial, a Biomedical Art and Visualization (BAV) student created a narrated 3D animation of the guttural pouch as part of their training program, under the supervision of anatomists, a clinician and BAV Certified Medical Illustration faculty. 3ds Max was used as the primary modeling software. Skull models were sourced as free assets from Sketchfab, and environment texture maps for lighting were downloaded from PolyHaven, while other anatomical models were custom-built for animation. To apply realistic textures, assets were exported to Maya to utilize its UV unwrapping tools, and textures were developed using Adobe Substance Painter. Narration audio was generated with OpenAI tools, and sound editing was completed in Adobe Audition.

Our model illustrates how the guttural pouches are formed as diverticula of the auditory tubes bilaterally, with each pouch divided into a larger medial compartment and a smaller lateral compartment by the stylohyoid bone. Important neurovascular structures, such as cranial nerves and carotid arteries, are shown as they course near or against the pouch. The results of this pilot trial allow dynamic exploration of the pouches from multiple perspectives, demonstrating strong potential for continuing the project and developing similar models.

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An analysis of student performance when companion animal and large animal anatomy courses are taught sequentially.

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Currently, at Utah State University, first-year veterinary students learn basic anatomy of the carnivore in fall semester. In spring, students participate in a large animal anatomy course that emphasizes comparative anatomical concepts, and a neuroanatomy course that reviews concepts introduced in the fall semester. A pre-test/post-test evaluation system was constructed that assesses students on facts and concepts covered in all three courses. The companion animal anatomy post-test was given at the end of both fall and spring semesters. This allowed us to evaluate retention of facts and concepts that were explicitly presented fall semester.

Twelve questions were asked at the beginning of fall semester (pre-test), at the end of fall semester as part of the final exam (post-test I), and at the end of spring semester as part of the final exam (post-test II). Post-test I questions were scored as a regular part of the final exam. Post-test II questions were worth extra credit.

The average pre-test score on the twelve questions was 30.91% ($n = 32$); the average post-test I score was 85.87% ($p < 0.001$). Only one question did not show a significant score improvement. The average post-test II score was 75.53% ($p < 0.001$), indicating significant retention of the information covered in the pre-test questions.

The second semester courses briefly reviewed the anatomy relevant to most pre-test questions; exact concepts were not covered. Only one pre-test question covered anatomy only relevant to the carnivore. On this question students improved significantly in fall semester but did not retain this information. This data suggests that even a brief review of anatomy in the second semester helps reinforce concepts and improve overall retention. Anatomy in the new USU CVM curriculum will be taught in a comparative, systems-based approach. Outcomes from this new approach will be compared to our current data.

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Morphological and immunohistochemical investigations on canine uterine tissue obtained from ovariohysterectomy

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The present investigation aimed to study the morphology and tissue distribution of hormonal receptors in the uterus of canines collected after ovariohysterectomy and to correlate these findings with the stage of reproduction and disease conditions. The uteri from female canines (n=54) presented to the Teaching Veterinary and Clinical Complex, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, for neutering and disease conditions where ovariohysterectomy was performed and used for histomorphological, immunohistochemical, and ultrastructural studies. The canine uteri were classified into prepubertal, pubertal, pregnant, and diseased. The lamina epithelialis comprised a simple columnar type of epithelium, with patches of pseudostratified columnar epithelium during prepubertal and pubertal stages. There were considerable variations in the histological architecture of the uterus at prepubertal, pubertal, gravid, and diseased uteri. The surface ultrastructure and transmission electron microscopy revealed that cellular features varied with the reproductive stages and diseased state. ER and PR are differentially expressed in different compartments of the uterus and in different groups. All cellular compartments of the canine uterus showed positive activity for estrogen receptor (ER) and progesterone receptor (PR) in all stages and diseased canines. The expression of receptors was strong in the endometrial glands and lining epithelium, whereas moderate activity was recorded in the stroma. The expression pattern of ER varied with the type of pathological conditions. In the papillary cystic hyperplasia, the expression of ER was strong in the cells lining the papilla towards the lumen, while the cells in the center were weakly positive. In the cystic type of hyperplasia, the cells forming the cyst wall showed strong PR positive reactions. Based on their expression pattern, it was inferred that the diseases related to the uterus in canines mainly depend on the progesterone hormone and the distribution of their receptors.

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Advancing Veterinary Anatomy Education: Evaluation of Formaldehyde-Free Embalming Techniques for Canine Cadavers

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The preservation of cadaveric specimens is central to effective anatomical instruction in veterinary education. However, traditional formaldehyde-based embalming methods pose notable health risks to students and instructors and often result in tissue rigidity and discoloration impairing educational value or effective clinical application. Additionally, Colorado State University's (CSU) new Veterinary Health and Education Complex (VHEC) will meet the WELL standard for certification, which limits occupant exposure to volatile gases including formaldehyde. To explore alternatives to the traditional formalin-embalmed cadaver, our anatomy program has utilized non-traditional embalming solutions, including Scarlet Imaging, GreenMBalm®, and in the future, Trinity Fluids. With the use of these solutions, the goal is to optimize safety, anatomical fidelity, and teaching potential in canine cadaver preparation. CSU teaches domestic animal anatomy courses to undergraduate, graduate, and DVM students. Undergraduate and graduate teaching consists of traditional 15-week semesters. DVM teaching in the VHEC will require cadavers to last for 7 weeks, with some cadaver re-use in subsequent years.

Since 2022 canine cadavers have been preserved using three distinct protocols: (1) Carolina's Perfect Solution® with added formalin, (2) Scarlet Imaging Solution (3) Green MBalm® Solution. Each cadaver was assessed for tissue pliability, color retention, odor levels, and preservation longevity. While some formalin-free cadavers initially demonstrated realistic tissue pliability and color, cadaver longevity has been inadequate to warrant adoption of a single technique. However, use of Scarlet Imaging for isolated organs (i.e. hearts, canine gastrointestinal tract, equine ascending colon) and amputated limbs have shown greater longevity than the whole cadaver for anatomical and surgical training purposes. Ultimately, our aim is to identify preservation strategies that maximize anatomical integrity, safety, and sustainability in veterinary teaching environments.

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A Multifunctional Nesfatin-1-Like Peptide in the Endocrine Pancreas of Domestic Animals

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Nesfatin-1, derived from nucleobindin-2 (NUCB2) is a multifunctional regulator of food intake, gastric motility, glucose levels, and energy balance. Nesfatin-1 is expressed in the central and peripheral tissues, including the digestive system. Nucleobindin-1 (NUCB1) is a protein structurally related to NUCB2, and a nesfatin-1-like peptide (NLP) is processed from it. Like nesfatin-1, NLP has many biological actions including the regulation of food intake and glucose homeostasis. We hypothesized that NUCB1/NLP are expressed in the pancreas of pig, dog, and cat. *In silico* analysis was conducted using sequences of NUCB1 proteins of several domestic animal species to assess the conservation of the NLP domain. This revealed a high degree of conservation in the sequence corresponding to NLP across these species. Specifically, the bioactive core region of the peptide was very highly conserved across species. Fluorescence immunohistochemistry on paraffin-embedded pancreatic tissues from pigs, dogs and cats was conducted to identify NUCB1/NLP. In both pigs and dogs, NUCB1/NLP was detected within the islets of Langerhans of the pancreas. NUCB1/NLP immunoreactivity was only found in the islet beta cells that produce insulin, but not in the glucagon-producing islet alpha cells. However, in the feline pancreas, while insulin and glucagon were detected within islets, no NUCB1/NLP was detected. No NUCB1/NLP immunostaining was detected in the exocrine pancreas of any of the species studied. Collectively, this research shows that NUCB1/NLP has tissue- and species-specific expression in the domestic animal pancreas. The presence of a newly identified regulatory peptide with multiple metabolic effects in the endocrine pancreas suggests significant functional roles for this peptide. Future studies aim to address the roles of NUCB1/NLP in domestic animal physiology.

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SARS-CoV-2 infection causes extracellular matrix dysregulation without altering islet structure in the pancreas of male Syrian golden hamsters.

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SARS-CoV-2 has been implicated in pancreatic dysfunction and new-onset diabetes. Our study investigated whether SARS-CoV-2 infection affected pancreatic cytoarchitecture and gene regulatory networks in male Syrian golden hamsters. We hypothesized that SARS-CoV-2 infection would result in alterations in pancreatic form and function. Following SARS-CoV-2 infection, hamsters exhibited transient hyperglycemia and weight loss, with plasma glucose peaking at day 6 post-infection (pi) before normalizing by day 14. However, no significant changes were observed in insulin mRNA, protein, or plasma levels. Similarly, islet morphometric analyses for insulin and glucagon revealed no alterations in islet architecture, suggesting preserved endocrine tissue structure. No sustained infiltration of CD4+ and CD8+ T cells was not found in the pancreas. RNA sequencing revealed downregulation of collagen genes, indicative of extracellular matrix (ECM) dysregulation, persisted from day 6 to day 14 pi. Downregulation of collagen genes and pathways associated with ECM interactions, such as *ECM-receptor interaction*, *focal adhesion*, *diabetic cardiomyopathy*, and *AGE-RAGE signaling in diabetic complications*, suggest ongoing ECM remodeling and potential tissue instability. While endocrine morphology remained unaffected, persistent collagen gene suppression could increase the risk of chronic conditions including diabetes or exocrine pancreatic insufficiency due to compromised structural and signaling functions of the pancreas. Longitudinal studies are needed to determine whether these changes persist, re-emerge, or exacerbate beyond day 14, contributing to the pathogenesis of post-viral pancreatic dysfunction.

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Funding: Centennial Enhancement Chair in Comparative Endocrinology

A teaching tool for interpreting cross-sectional images

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Currently in veterinary medicine several imaging modalities provide transections of the area being imaged. This includes ultrasound, CT and even MRI. Interpreting those images requires that the anatomy learned through dissection and the study of anatomical drawings be understood well enough that one can imagine how it would look in cross-section. This is very challenging to do and brings into play all of the anatomical knowledge for the region being imaged. The hypothesis for this project is that specially designed teaching models can be created that will enhance the understanding of cross-sectional anatomy and improve the efficiency of learning and the retention of that knowledge. The first step in testing this hypothesis is to create the anatomical models. Canine cadaver legs were dissected to reveal the musculature, especially the extensors and flexors of the limb. The dissection was then plastinated to create a durable model that does not require any special care for storage and handling. The plastinated limb was then cut so that two or three transections were made across the limb in areas that are typically investigated clinically using ultrasound. The design of the model allows the different leg transections to be reattached by the placement of magnets on each side of the cut section. The magnet technique has been used successfully in skeletal models, and it was adapted for use in plastinated models for this application. This required investigation into adhesives compatible with silicon based plastination which are strong enough to retain the magnet when the sections are pulled apart. The individual muscles were painted to make them easier to locate, both on the superficial surfaces of the leg, and within the transected cuts. A legend identifies the colour associated with each muscle. Multiple legs were prepared, some without colouring to be used for student assessment.

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Notes

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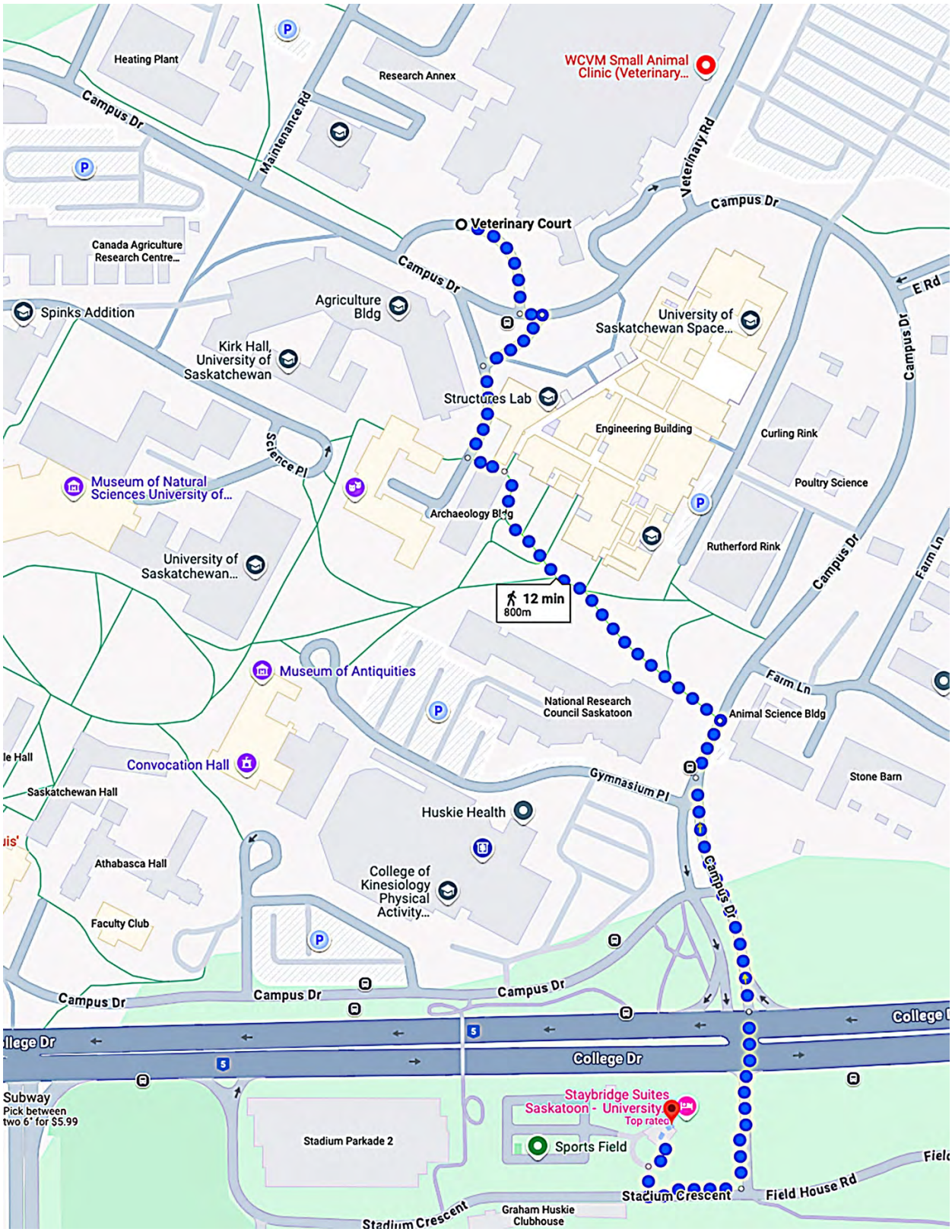
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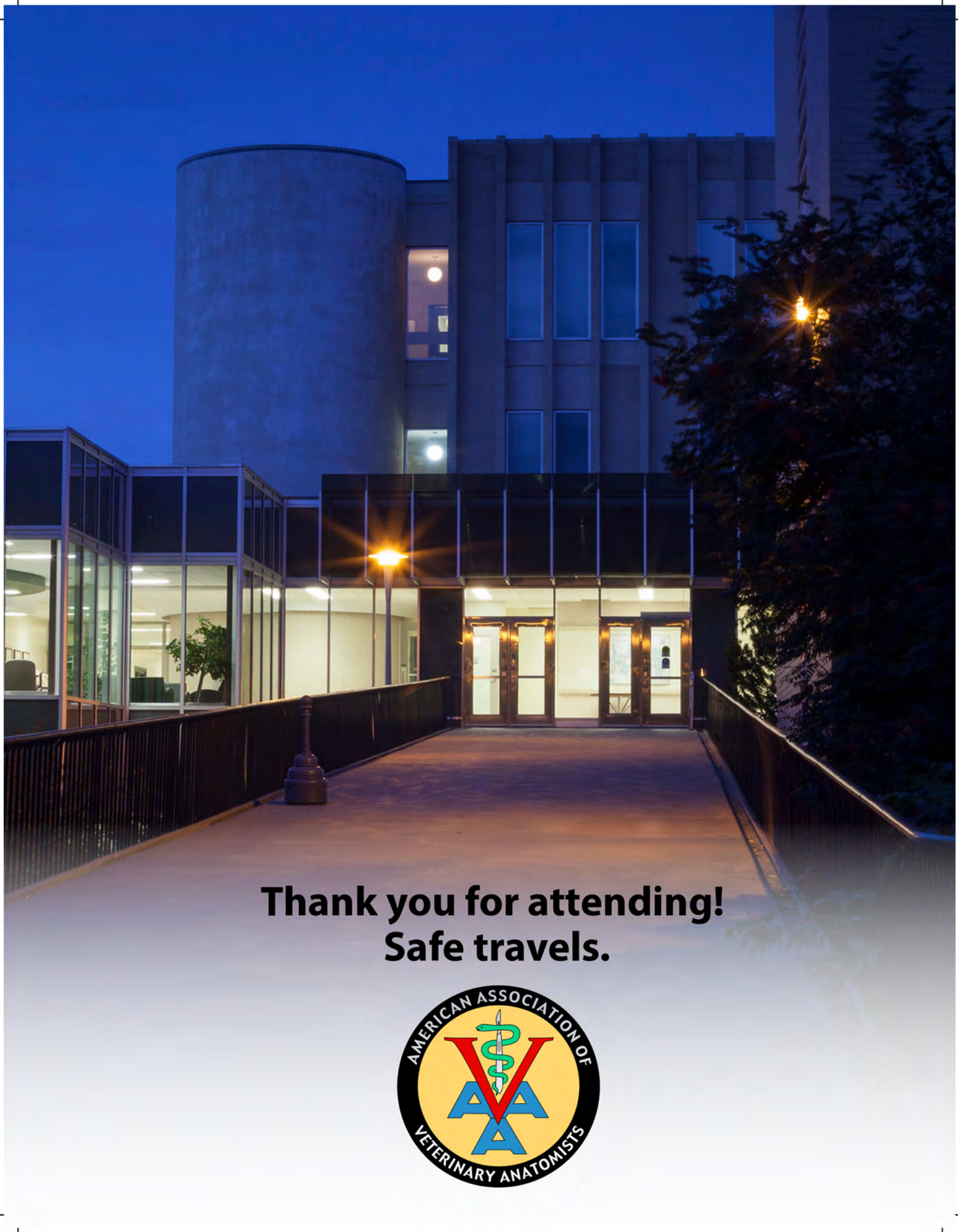
Staybridge Suites Saskatoon - University
Top rated
Stadium Parkade 2
Sports Field
Stadium Crescent
Field House Rd
Graham Huskie Clubhouse


Thank you for attending!
Safe travels.
AMERICAN ASSOCIATION OF
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