American Association of Veterinary Anatomists 2023 Conference

July 20-23, 2023
Joplin, Missouri.

Welcome!!

Thank you for attending the AAVA 2023 meeting.

We are very excited that AAVA members can meet in person this year. We are looking forward to visiting with our colleagues and friends, meeting new people in the field, and sharing our ideas and experiences.

The conference presentations are diverse enough to satisfy broad interest areas. We are eager to attend the presentations on innovations in teaching anatomy and new discoveries in anatomical science, anatomical simulations, and policy development. We also hope that you will find the embalming workshop useful and timely.

We have been diligently working out conference details and cannot wait for a successful meeting. This meeting is being held at the Missouri Southern State University campus and sponsored by Kansas City University here in Joplin, Missouri.

Enjoy Joplin, the four-state area, 'Once-in-a-lifetime opportunity': the stunning comeback of a tornado-wrecked town. Joplin, Missouri, was left unrecognizable after the 2011 disaster. Its recovery offers lessons for other communities. By the time it dissipated, the 22 May 2011 tornado was among the deadliest in US history. But the city insisted on a message of unrelenting hope and optimism for its future. It was a town built on strong connections and resilience. The city was able to grow again. New parks, an art center, a medical school, and an incoming dental school as indicators of how Joplin has changed.

Please let us know if there is anything we can do to ensure you have an excellent experience at the 2023 AAVA conference!

Thank you again,

The Local Organizing Committee

Shireen Hafez

Sharon Gordon

Karie Currence

The AAVA Executive Committee

Dave Cross

Shireen Hafez

Karen Hershberger-Baker

Steve Lampa

2023 AAVA Conference

KEYNOTE SPEAKER

Dr. David Morton, PhD, FAAA

At the University of Utah School of Medicine (UUSOM) Dr. Morton is a Professor of Neurobiology and serves as the Vice-Chair of Medical and Dental Education. He is a curriculum leader, directs multiple courses, and teaches anatomy, physiology, histology, and neuroanatomy to medical, dental, PA, PT and OT students. Dr. Morton has received numerous teaching awards, including the American Association for Anatomy Henry Gray Distinguished Educator Award, the University of Utah Distinguished Teaching Award and the UUSOM Leonard W. Jarcho, MD Distinguished Teaching Award. His research interests and publications focus on the creation and incorporation of active learning activities and the use of cadavers in medicine. Dr. Morton authored multiple textbooks including The Big Picture: Gross Anatomy (Lange, McGraw Hill), The Big Picture: Histology (Lange, McGraw Hill) and Gray's Dissection Guide for Human Anatomy (Churchill Livingston, Elsevier). His video tutorials on YouTube (The Noted Anatomist) have received over 21 million views with over 400K subscribers. Dr. Morton is an internationally recognized educator and speaker, a Fellow in the American Association for Anatomy and is a visiting professor to three medical schools in Ghana.

2023 American Association of Veterinary Anatomists Conference

July 20-23, 2023

All events are held in Conner Ballroom, Billingsly Student Center

3950 E Newman Road, Joplin, MO 64801, unless otherwise specified

Thursday

3:30 - 4:30 PM Registration and bags pickup

4:30 - 6:30 PM Welcome Reception

5:00 - 5:15 PM KCU Welcome Note

Sharon Gordon – Associate Dean of Academic Affairs and Research, KCU College of Dental Medicine

Friday

8:00 - 9:00 AM **Registration and bags pickup**

9:00 – 9:30 **Introduction & Welcome**

David Cross – AAVA president

Shireen Hafez – AAVA President-elect

9:30-10:30 **Keynote speaker presentation**

David Morton – Professor of Neurobiology and Vice-Chair of Medical and Dental Education, The University of Utah School of Medicine

10:30-10:45 **Break**

Session I – Chair: Shireen Hafez – AAVA president-elect

10:45 - 11:00 **Pre-Lab Videos as a Supplemental Teaching Tool in First-Year Veterinary Gross Anatomy**

Chandler Hansen – Kansas State University

11:00 – 11:15 **The Role of Undergraduate Anatomical Education in Preparing Students for Clinical Programs**

Claire Nelson – Missouri Southern State University

11:15 – 11:30 **Pilot Study: Successful Use of the Critical Incident Questionnaire for Feedback and Reflection After Anatomy Instruction**

Karen Hershberger-Baker – University of Wisconsin-Madison

11:30 – 11:45 Break for no-show presentation

11:45 – 12:00 **A novel method to manage student questions in the anatomy laboratory using a virtual meeting platform**

Pradeep Malreddy – Kansas State University

12:00 – 1:30 Lunch

Session II – Chair: Karen Hershberger-Baker – University of Wisconsin-Madison

1:30 – 1:45 **Methodology for creating 3D-printed anatomical models used for anatomy education**

Damon Mango – Colorado State University

1:45 – 2:00 **Will virtual reality help students learn gross anatomy? How two measures of visual-spatial ability describe the relationship between learning with three-dimensional models and assessment outcomes.**

Jason Martin – Colorado State University

2:00 – 2:15 **Methodology for Creating Interactive Anatomy-Guided Quizzes**

Paulina Svec - Colorado State University

2:15 – 2:45 # **Virtual Reality demo**

2:45 – 3:15 **Green Solution demo**

3:30 – 8:00 **Crystal Bridges / Conference Photo**

Saturday

Session III – Chair: David Cross – University of Missouri

8:45 – 9:00 **Tales Tails can Tell: anatomy of the caudofemoralis longus muscle in archosaurs**

Ray Wilhite – Auburn University

9:00 – 9:15 **The Musculature of the Tail and Cloaca in the Macaroni Penguin (*Eudyptes chrysolophus*) as Compared to the Domestic Chicken (*Gallus gallus domesticus*)**

Jose Rodriguez-Sosa – Midwestern University

9:15 – 9:30 **The Catecholaminergic Component Within Cervical Vagus Nerve Influences Heart Remodeling: A Pilot Study**

Eryn Wagner – Missouri Southern State University

9:30 – 9:45 **A review of venipuncture sites in Alligator mississippiensis with anatomical description of a novel venipuncture site**

Ray Wilhite – Auburn University

9:45 – 10:00 **Histology of the internal reproductive organs of the female Arabian oryx (Oryx leucoryx)**

Josa Rodriguez-Sosa – Midwestern University

10:00 – 10:30 Break

10:30 – 10:45 **Development of a Low Cost, 3D Printable Canine Prosthetic**

Alexander Lee – Louisiana State University

10:45 – 11:00 **Ultrasonography simulator of canine thoracic, abdominal, and pelvic cavities**

Fawzy Elnady – Virginia Tech

11:00 – 12:00 **How to embalm: tips and tricks workshop**

Shireen Hafez – AAVA president-elect

12:00 – 1:30 Lunch

1:30 – 3:30 AAVA **Business Meeting** (members only)

3:30 – 6:00 Free time/ prepare for Banquet

6:00 – 9:00 Gala Banquet Dinner

Sunday

Session IV – Chair: Tiana Magee – Colorado State University

8:45 – 9:00 **Morphological and histochemical observations on the oesogaster of the domesticated African catfish (*Clarias gariepinus* Burchell, 1822)**

Ekele Ikpegbu – Tufts University

9:00 -9:15 **Giving a leg up: Development of canine pelvic limb models as learning tools.**

Fawzy Elnady – Virginia Tech

9:15 – 9:30 **Development of the American Association of Veterinary Medical College Guidelines for the Use of Animals in Veterinary Education**

Jeremy Delcambre – Louisiana State University

09:30 – 10:00 **Human vs Veterinary Anat. Teaching / Career Opportunities workshop**

Shireen Hafez – AAVA President-elect

10:00 – 10:30 Closing Remarks

10:30 – 11:15 MSSU and MSSU anatomy lab tour

11:15 -11: 45 Boxed lunch pickup

11:45 – 01:45 KCU and KCU anatomy lab tour


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VETERINARY ANATOMISTS
Lorem Ipsum

PRESENTATION ABSTRACTS

001 – **Pre-Lab Videos as a Supplemental Teaching Tool in First-Year Veterinary Gross Anatomy**

Chandler Hansen[1], Matthew T. Basel[1], Andrew Curtis[1], Pradeep Malreddy[1]

[1]College of Veterinary Medicine, Kansas State University

To adapt to an interactive generation of learners, video resources can provide information necessary for lab preparation, describe clinical correlations, and optimize dissection time. First-year Kansas State University Doctor of Veterinary Medicine (DVM) students were asked to view annotated pre-lab videos embedded with a 5-point quiz prior to each dissection lab. The purpose of these videos was to help students identify and describe relevant anatomical structures. Significant correlations were found between practical exam grade and number of pre-lab videos viewed for exam 1 (R = 0.199, P-Value = 0.029, T-Score = 2.212), exam 3 (R = 0.218, P-Value = 0.017, T-Score = 2.421), and exam 4 (R = 0.384, P-Value = 0.0000153, T-Score = 4.512). The strongest correlation being exam 4 pre-lab video views and practical exam 4 score. Exam 4 pre-lab video views also predicted lower quartile student practical exam 4 grade by 21% (R^2 = 0.206). Significant correlations were found between average practical exam score and total number of pre-lab videos viewed throughout the semester (R = 0.303, P-Value = 0.000756, T-Score = 3.458), and final course grade and total time spent viewing all pre-lab videos (R = 0.216, P-Value = 0.018, T-Score = 2.402). A significant correlation was found between average pre-lab quiz score and practical exam score for exam 1 (R = 0.389, P-Value = 0.0000237, T-Score = 4.402), exam 2 (R = 0.473, P-Value = 0.000000250, T-Score = 5.475), and exam 4 (R = 0.291, P-Value = 0.00157, T-Score = 3.237). These findings suggest that interaction with the pre-lab videos had a positive impact on student exam scores. These findings confirm that pre-lab videos are a supplemental resource that may be provided to students to complement their learning.

002 – **The Role of Undergraduate Anatomical Education in Preparing Students for Clinical Programs.**

Claire Nelson[1], Dhvani Patel[1], Raasil Basha[1], Aadhya Subhash[1], Donna Johnson[1], Crystal R Lemmons[1], Shelby Kuhnert[1], and Alla G Barry[1].

[1]Missouri Southern State University

Anatomy has survived the test of time, remaining a key pillar of medical education. However, over the last two decades, compression of anatomical course hours, the decline in dedicated cadaver dissection time, and the controversial shift toward virtual dissection have been reported. Moreover, evidence has shown a lack of adequate anatomical knowledge in physicians and medical students, which can be hazardous to patient safety. Surprisingly, there is still no requirement for anatomy as a prerequisite for medical or dental schools in the United States. Comprehensive anatomical-based and clinically-focused undergraduate premedical education can contribute to student success in reaching core pillars such as compassionate patient care, medical knowledge, and communication skills, as outlined by the Accreditation Council for Graduate Medical Education. For the last ten years, MSSU has offered an Advanced Human Dissection (AHD) course, utilizing the “first patient” approach. The objective of the present study was to assess students’ perception of the usefulness of cadaver-based anatomy education at the undergraduate level. The Likert scale survey evaluating the benefits of cadaver-focused learning was administered to MSSU students who completed AHD and are currently attending medical or dental schools (n=36). Open-ended student responses were analyzed qualitatively. All respondents rated the undergraduate human dissection laboratory as the most helpful tool in learning anatomy and reported confidence regarding their preparedness for clinical programs. The cadaveric study of anatomy in undergraduate programs provides an opportunity to utilize a multi-faceted approach by integrating gross anatomy, histology, and pathology, as well as developing communication, teamwork, observational, and leadership skills, thus should be considered as a prerequisite for medical education.

003 – **Pilot Study: Successful Use of the Critical Incident Questionnaire for Feedback and Reflection After Anatomy Instruction**

Karen Hershberger-Baker[1]

[1]School of Veterinary Medicine, University of Wisconsin-Madison

The Critical Incident Questionnaire (CIQ) is an evaluation tool that provides instructors with valuable feedback from their students about a recent learning experience. Developed by Dr. Stephen Brookfield, the CIQ focuses on critical moments or actions in a learning session, as identified by the learners. As the students reflect on a learning session, they create an opinion based on their thoughts and feelings, moving them into a reflective stage, which is an essential part of Kolb's four-part learning cycle for experiential learning. In this pilot study, the CIQ was applied to in-person, hands-on veterinary anatomy instruction. During the 2022-20223 academic year, the CIQ was distributed electronically up to twice a week for voluntary completion by the first-year veterinary students enrolled in the small animal (canine dissection) and large animal (bovine and equine prosections) anatomy courses. These courses were substantially modified this academic year with the addition of many new active learning sessions. While the response rate to the CIQs varied, approximately 25% of students consistently provided responses throughout the year. The responses to the CIQ provided actionable weekly feedback to the instructors on both existing and newly created course modules, and provided students with a structured platform for reflection on their experiences during these learning sessions. This pilot study demonstrated that the CIQ can be successfully applied as a feedback and reflection tool after anatomy instruction. Students' responses offered valuable insights into their perceptions of a particular learning session. The CIQ proved to be a simple and effective tool to promote student reflection and to provide instructors with frequent feedback on the course's learning environment and effectiveness. This study highlights the potential of the CIQ and suggests that the CIQ has potential for wider application across a range of educational settings.

Brookfield, S. (1996) 'Experiential Pedagogy: Grounding Teaching in Students' Learning.' *The Journal of experiential education*, 19 (2), 62-68.

004 – **A novel method to manage student questions in the anatomy laboratory using a virtual meeting platform**

Judy Klimek[1], Cathryn Sparks[2], Lynn Abel[1], Pradeep Malreddy[1]

[1]College of Veterinary Medicine, Kansas State University,
[2]School of Veterinary Medicine and Biomedical Sciences, Texas A&M University, Canyon, TX

The significant class size in anatomy courses, in conjunction with a limited number of instructors, poses challenges for laboratory groups to have their questions addressed in a timely manner. This is due to instructors often being unaware of the number and order of assistance requests, resulting in students waiting for extended periods for instructor availability. To mitigate this issue, a novel approach was conceived following brainstorming sessions with students, culminating in the idea of a "call button" system. This system was brought to life through the collaborative effort of instructors and the college's IT department, who proposed the use of Zoom Webinar's Question and Answer (Q&A) feature. This platform allows a Zoom meeting to be broadcast to up to 50,000 participants, with instructors interacting with students through the Q&A feature. 120 first-year students in the Doctor of Veterinary Medicine curriculum were grouped into 28 dissection groups and assigned to a dissection station. One representative from each group joins the webinar using their dissection table number as an ID, and posts their queries on the Q&A. These questions, accompanied by a timestamp, are queued in the instructors' (acting as panelists) Q&A window. The instructors then use the "type answer" feature to recognize the question by entering their initials. This information is visible to other instructors in real-time, allowing for an efficient, first-in/first-out approach to addressing student queries. The implementation of this system for the small animal anatomy course resulted in positive feedback based on student teaching evaluations. This method streamlined the process of question handling, ensuring timely responses to student queries, thereby improving the overall learning experience. The success of this initiative suggests a potential for its application in other large-scale educational settings.

005 – **Methodology for creating 3D-printed anatomical models used for anatomy education**

Damon Mango[1], Paulina Svec[1], Andrew Garrett[1], Jason Martin[1], Anna Fails[1], Andrea Linton[1], Christianne Magee[1]

[1]College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO 80521.

The emergence of 3D printing technology has made it possible to replicate anatomically accurate models at a lower cost, making them more accessible for educational purposes. The COVID-19 pandemic has further highlighted the importance of accessible and remote learning in anatomy education. The objective of this project was to create a consistent and easy-to-use 3D canine hemiskull. Photogrammetry methods and Meshmixer (https://meshmixer.com/) were used to create a 3D model for both 3D printing and for use in the Virtual Animal Anatomy - Virtual Reality program. The model was scaled down to approximately 0.8 times the size and modified before being exported as an STL file. After a 3D test print, feedback from anatomists was obtained and changes were made to increase anatomical accuracy and usability. AVID Product Development (https://avidpd.com/) printed 90 hemiskulls ($63 each) using a MJF PA12 platform. In preparation for the remote portion of the Spring 2021 semester, 52 3D-printed and 24 real skulls (calvaria removed, articulated mandible) were distributed to undergraduate anatomy students. T-test analysis of the end-of-semester course survey questions using a 1-7 Likert scale indicated that students with real skulls (n=18) found them to be more useful (p=0.002) and would be more likely to keep the skull for future study (p=0.03) than those (n=34) with a 3D-printed skull. Regardless of skull type, 83% of students agreed that the Virtual Animal Anatomy (VAA) program was helpful during remote learning, but students with the 3D skulls rated VAA as more useful than their 3D skulls. This study demonstrates the feasibility of creating 3D anatomical models for educational purposes using 3D printing technology, with the potential to improve accessibility when cadaver-based specimens are unavailable. Student feedback also illustrates the importance of providing realistic, cadaver-based atlases to support learning.

006 – **Will virtual reality help students learn gross anatomy? How two measures of visual-spatial ability describe the relationship between learning with three-dimensional models and assessment outcomes**

Jason Martin[1], Andrea Linton[1], Gwen Cahill[1], Andrew Garrett[1], Damon Mango[1], Paulina Svec[1], Christianne Magee[1]

[1]College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO 80521.

Virtual reality (VR) headsets are poised to change anatomical teaching. Prior literature inconsistently reports that learning benefits gained from virtual anatomical tools depend on learners' existing spatial abilities. The purpose of this study was to compare students' (N = 96) visual-spatial ability (measured via Mental Rotation Task [MRT] and Landmark Position with Map [LPM] tests) with learning outcomes from three experimental anatomy sessions and undergraduate anatomical course examinations. During experimental sessions, students were given a test following a brief instructional session using one of three resources: a physical gross specimen, digital photographs of the specimen, a rotatable 3D (r3D) specimen (i.e., monoscopic), or a VR specimen (i.e., stereoscopic). There was a positive linear relationship between MRT scores and experimental learning outcomes for all specimen formats (r = .01 to .91) except for students in session two who engaged with the VR specimen using controllers (r = -.56 to -.29). There was also a negative linear relationship between LPM scores and experimental learning outcomes for students using VR (r = -.71 to .39) and r3D (r = -.41 to .43). The combination of presentation format and visual-spatial ability did not explain performance differences on experimental tests. There was a correlation (r = .25 to .42, $p < .05$) between all MRT session scores and temporally associated course examination scores, but there was only a correlation between LPM scores and the first course examination score (r = -0.32, $p < .05$). Student MRT scores were predictive of course examination scores within the first month of cadaveric and monoscopic instruction. Future research involving greater curricular adoption of r3D and VR may reveal a relationship between LPM scores and course examination scores. For instructors, these findings support accounting for diversity in learner visual-spatial ability when selecting resources.

007 – **Methodology for Creating Interactive Anatomy-Guided Quizzes**

Paulina Svec[1], Damon Mango[1], Andrew Garrett[1], Jason Martin[1], Andrea Linton[1], Christianne Magee[1]

[1]College of Veterinary Medicine and Biomedical Sciences, Fort Collins, CO 80521.

The COVID-19 pandemic required anatomy instructors worldwide to innovate in the absence of in-person and cadaveric laboratory learning. Scaffolding is a strategy that can be used to support a learner to bridge the gap between what the learner is able to do prior to instruction and the desired behavior or knowledge post-instruction. In March 2020, faculty of Colorado State University's undergraduate animal anatomy course developed "guided quizzes" to facilitate a scaffolded learning environment during lockdown. Using scaffolding learning strategies, instructors implemented guided quizzes into the course learning management system (Canvas) to help students progress through critical anatomical concepts, creating intervals of assessment and opportunity to learn within the quiz, such that learners received immediate feedback and additional learning resources immediately within the guided quiz to bridge their knowledge gap. To objectively assess the impact of the guided quizzes, student course evaluations from Spring 2020 demonstrated that 84.1% of students found guided quizzes to be helpful in their transition to online learning (Martin et al., 2022). Implementation of guided quizzes into the 2021-2022 offerings of this course continues to demonstrate that students value guided quizzes as much as they value the Virtual Animal Anatomy program to facilitate their learning. A qualitative analysis of student course survey responses from 2021-2022 demonstrates that guided quizzes helped students to understand challenging anatomical structures and were a valuable learning resource. The scaffolding methodology used to create these quizzes can be implemented into any learning management system to provide anatomy learners with not only timely and effective feedback on their learning, but also opportunity to learn within the assessment. With growing course sizes, limited qualified instructors of anatomy, and limited resources for teaching anatomy, guided quizzes are an effective teaching tool for anatomy instructors to implement into their courses.

008 – **Tales Tails can Tell: anatomy of the caudofemoralis longus muscle in archosaurs**

Ray Wilhite[1]

[1]College of Veterinary Medicine, Auburn University

The caudofemoralis longus in crocodilians has been referenced by multiple authors both in studies of extant species and extinct archosaurs. However, a comprehensive anatomical study of this important muscle has never been published. A detailed anatomical study of m. caudofemoralis longus in *Alligator mississippiensis* using multiple imaging and dissection techniques was conducted. While many aspects of m. caudofemoralis longus anatomy found in the current study agree with previous authors' works, a number of significant differences were found between the most often cited works on m. caudofemoralis longus anatomy and that presented here. The chevrons (hemal arches) and the membranous spaces between the chevrons were found to constitute the majority of the origin of m. caudofemoralis longus in *Alligator*. Also, new distal components of m. caudofemoralis longus via the insertion of m. gastrocnemius show that m. caudofemoralis longus has direct effect to the level of the metatarsophalangeal joints. The importance of a fat and fascia layer separating m. caudofemoralis longus from m. ilio-ischio- caudalis was also noted, as well as its possible effects on m. caudofemoralis longus function. Finally, this study showed that chevron morphology is the most important anatomical feature to consider when attempting to reconstruct m. caudofemoralis longus anatomy in extinct archosaurs.

009 – **The Musculature of the Tail and Cloaca in the Macaroni Penguin (*Eudyptes chrysolophus*) as Compared to the Domestic Chicken (*Gallus gallus domesticus*)**

Jose Rodriguez-Sosa[1,2], T. Schmitt[3], E. Clarke[3], Dominik Valdez[2], Justin Georgi[1,2], and Margaret I. Hall[1,2].

[1]Colleges of Veterinary Medicine, Midwestern University, Glendale AZ 85308.

[2]College of Graduate Studies, Midwestern University, Glendale AZ 85308.

[3]Department of Veterinary Care, SeaWorld, 500 Sea World Way, San Diego, CA 92109

Macaroni penguins have a behaviorally important tail and cloacal region that they use for swimming, for defecation, and possibly for inter-individual communication. The aim of this study was to focus on the tail and cloacal musculature to provide anatomical context to these important behaviors. We dissected one male and one female Macaroni penguin obtained from Sea World using standard dissection techniques and documented our work with digital photographs. Our dissections demonstrated that, when compared to the chicken, the muscles are significantly more robust with attachments both to the hindlimb and to the cloaca. The pygostyle is comparatively elongated, and the dorsal tail muscles, including m. levator caudae and m. lateralis caudae attach to both the pygostyle and to the caudal vertebral column. The m. transversus cloacae presents as comparatively very wide and flat in the Macaroni penguin, and takes broad attachment to the pubis, the ischium, and to two muscles, the m. external abdominal oblique and the newly described m. adductor tibialis. These broad attachments allow us to interpret tail movements, including acting as a rudder during swimming. Additionally, this anatomy may allow for the Macaroni penguin's unusual defecatory behavior in birds, where they are able to project waste 2-3 feet out of their nests.

010 – **Morphological and histochemical observations on the oesogaster of the domesticated African catfish (*Clarias gariepinus* Burchell, 1822)**

Ekele Ikpegbu[1,2], Chikera Ibe[2], Ezeasor Daniel[3], Uchenna Nlebedum[2], Nnadozie Okechukwu[2]

[1] Cummings School of Veterinary Medicine, Tuft University

[2] College of Veterinary Medicine, Michael Okpara University of Agriculture, Nigeria.

[3] Faculty of Veterinary Medicine, University of Nigeria.

The morphology of the intermediate region between the adult caudal oesophagus and cardiac stomach usually referred to as oesogaster was investigated in the farmed African catfish sourced from commercial concrete tank aquaculture in Eastern Nigeria. The alimentary tract (AT) was dissected to fill the dearth of information from available literature on the species digestive tract biology, especially those from concrete tanks. Fifteen adult African catfish measuring average weight of 900g and a standard body length of 475cm were used for the study. The fish were euthanized, and the AT was dissected out. The specimen under study, Oesogater was excised and immediately fixed in 10% neutral buffered formalin, and processed through routine histology. Sections 5µm thick were obtained and appropriately stained. The oesogaster was characterized by covering of PAS positive stratified mucous epithelium and gastric gland within the lamina propria. It contained a combination of the epithelia seen in both esophagus and stomach. The gastric mucosa had the presence of oxyntopeptic cells in the lamina propria but these cells were absent in the region with esophageal-like epithelium. The tunica muscularis in this transition region contained skeletal muscle fibers. Tunica serosa was observed. The presence of the oesogaster in a stomach possessing fish may be speculative of a possible adaption to fast deglutition in an intensive rearing environment. This structure may be serving as an extension of esophageal muco-substances that will help lubricate AT from rough feeds, possibly add extra carbohydrates to the fish diet, and buffer the effect of acid from the oxyntopeptic cells. The invasion of the gastric glands in this region may be suggestive of an adaptation to increase surface area for gastric digestion.

011 – **A review of venipuncture sites in Alligator mississippiensis with anatomical description of a novel venipuncture site**

Ray Wilhite[1], Javier Nevarez[2],

[1]School of Veterinary Medicine, Auburn University

[2]School of Veterinary Medicine, Louisiana State University

Numerous crocodilians are currently kept in captivity, either on large farms where they are raised for their hides or in zoological parks. Venipuncture for routine bloodwork as well as drug administration is a vital part of any captive animal program. Here we describe and illustrate the sites of venipuncture in the alligator using CT reconstructions, cross-sectional anatomy, and traditional dissection. The two sites most often described for venipuncture in *Alligato*r are the occipital sinus and the caudal vein. We also consider a third possible site, the ventral abdominal veins. Finally, we describe a novel site for venipuncture in crocodilians, the lateral occipital sinus. We then describe the clinical approach for each venipuncture site and evaluate its effectiveness. The ventral abdominal veins were found to be inconsistent in location and lack any practical use for normal venipuncture. The occipital sinus offers good access but increases the risk of spinal cord injury during venipuncture. The tail vein is a reliable site for venipuncture in small animals (< 1.5 meters) but requires an impractically long needle in larger specimens. Based on the author's experience, the lateral occipital sinuses offer the safest, simplest, and most consistent access for venipuncture in the alligator. Future studies should examine other crocodilian species to confirm the presence of the lateral occipital sinuses.

012 – **Histology of the internal reproductive organs of the female Arabian oryx (Oryx leucoryx).**

Jose Rodriguez-Sosa[1,2], Jeffrey Plochocki[3], Saul Ruiz[1], Dominik Valdez[1], KEB Townsend[1].

[1]College of Graduate Studies, Midwestern University, Glendale, AZ

[2]College of Veterinary Medicine, Midwestern University, Glendale, AZ.

[3]Univerity of Central Florida, Orlando, FL.

The Arabian oryx (Oryx leucoryx) is a vulnerable species. Knowledge on the anatomy of its reproductive system is necessary for its conservation. The gross anatomy of this system has been described, but not its microanatomy. With the aim of describing it, the ovaries, uterine tubes, uterus, and vagina were collected at necropsy of one adult female oryx. Samples from each organ were processed for routine histology (H&E). A layer of dense connective tissue, the tunica albuginea, encloses the ovary. This covers the cortex, which encloses the medulla. The cortex embeds follicles at several stages of development. A rich bed of blood vessels is present in the medulla, especially at the hilum. The uterine tubes are comprised of a serosa, muscularis, and mucosa. The muscularis is constituted of circular smooth muscle covered by a thin layer of longitudinal fibers. The mucosa has longitudinal folds and has a pseudostratified epithelium with ciliated and non-ciliated cells. The uterine horns open separately into the cervix and are constituted of a serosa, muscularis, and mucosa. The muscularis contains an inner circular layer of smooth muscle and an outer longitudinal one. The mucosa possesses a pseudostratified epithelium. Simple coiled glands are present in the lamina propria. No glandular regions with highly cellular projections are present (the caruncles). The mucosa of the cervix contains four dense rings lined by longitudinal folds made of a stratified squamous epithelium. Numerous glands are located in the lamina propria and contain simple columnar epithelium. The vaginal wall was made of a serosa, muscularis, and mucosa. The inner layer of the muscularis consisted of circular smooth muscle fibers enclosed by longitudinal fibers. The mucosa is made of stratified squamous epithelium. In summary, the histology of the internal reproductive organs of the oryx is like that of other mammals, especially ruminants.

013 – **Development of a Low Cost, 3D Printable Canine Prosthetic**

Alexander K. K. Lee[1], Michelle L. Osborn[1]

[1]School of Veterinary Medicine, Louisiana State University.

Total amputation is the traditional treatment for canines that require forelimb amputation, but it has disadvantageous impacts on gait, weight distribution, and overall mechanics. Partial limb amputations are becoming more popular for those cases in which the amputated limb has an adequate area for prosthetic attachment. As a result, there is a need for a prosthetic designed for the partial limb. Traditional prosthetic production methods are costly and time-consuming; 3D printing has the potential for rapid prototyping and customization of a prosthetic at a lower cost. This project aims to develop a 3D printable trans-radial thoracic limb canine prosthetic that is based on (A) printing ease, assembly, and overall cost in mind; and (B) tensegrity principles. (A) FDM (Fused Deposition Modeling) printing was found to be the most viable candidate for this project; several different filament types will be compared for durability and cost. (B) Most prosthetic designs are based on rigid mechanics and fail to mimic natural movement. Tensegrity is the principle of structure consisting of compressive elements within a tension framework and has been used in a biological setting to better understand the way bodies move (biotensegrity). A 3D rigged model of a canine skeleton from CT data was created and used to develop two initial prosthetic designs based on the principles of biotensegrity that will be printed and tested for viability based on durability, cost, ease of production, and movement. The first design is based on multiple rigid rods held together by tensile “strings.” The second design comprises “tree” structures tied together by tensile “strings.” The next steps also include printing the prosthetic designs on two machines of varying price points to compare the quality of print from a higher-cost machine to that from a lower-cost machine.

014 **Ultrasonography simulator of canine thoracic, abdominal, and pelvic cavities.**

Fawzy Elnady[1], Yusuf Elnady[2]

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A novel simulator for ultrasonography of the thoracic, abdominal, and pelvic cavities in canines is described in this study. Ultrasonography plays a crucial role in diagnosing canine diseases, and the need for an accurate simulator to train veterinary professionals has grown. The simulator utilizes a realistic canine body specimen created using the Elnady technique, involving the plastination of an ethically sourced cadaver. A lifelike model is achieved by dehydrating the formaldehyde-embalmed cadaver with acetone, impregnating it with glycerin, and curing it with cornstarch. The simulator incorporates Radio Frequency Identification (RFID) tags placed at appropriate locations within the body cavities to enable ultrasonographic examination of various organs. A concealed RFID reader, housed within a 3D-printed mock probe, is connected to an Arduino Uno and a computer. Pre-recorded video clips of normal ultrasonographic examinations are triggered when the tags are read by the reader. This simulator provides a safe and controlled environment for veterinary students and professionals to study the normal ultrasonographic anatomy of internal organs, enhancing their eye-hand coordination skills. Additionally, the simulator offers a customizable range of pathologies and anatomical variations, allowing users to tailor their learning objectives. The simulator's durability and high realism contribute to improved efficiency in ultrasonographic examinations and aid in the interpretation, diagnosis, and treatment of canine diseases. Ultimately, this innovative simulator holds promise for advancing veterinary ultrasound education and training, leading to better outcomes for canine patients.

015 The Catecholaminergic Component Within Cervical Vagus Nerve Influences Heart Remodeling: A Pilot Study.

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The tandem of two antagonistic divisions of the autonomic nervous system, parasympathetic and sympathetic, controls cardiac functions such as heart rate, contractility, and coronary blood vessel diameter. Increased sympathetic outflow is involved in cardiac remodeling leading to the development and progress of congestive heart failure. Concurrently, parasympathetic activity may exert a protective effect on the heart. The Vagus Nerve (VN) is known as a principal source of preganglionic parasympathetic fibers to the heart. However, the presence of catecholaminergic fibers, presumably postganglionic sympathetic, ranging from 0% to 22%, has been detected through immunohistochemical assessment of the VN with anti-tyrosine hydroxylase (TH) antibody. The present study aimed to evaluate the correlation between the quantity of TH+ fibers within the cervical VN and the degree of heart remodeling. Human cervical VN samples were collected bilaterally from 6 embalmed cadavers (male n=3, females n=3) at superior and inferior cervical ganglia levels for histological examination. All samples were evaluated for TH reactivity. Heart dimensions and wall thickness were measured before collecting myocardium for histological processing. Samples were harvested from both ventricles and interventricular septum and stained with trichrome to evaluate the presence of Connective Tissue (CT). All slides were photographed for quantitative analysis using ImageJ. The linear regression showed a significant positive correlation between the thickness of the right ventricular wall and the number of TH+ fibers in the left VN ($p=0.02$). A trend towards increased CT within both ventricles and TH+ fibers within the right VN was apparent. The results of our pilot study revealed a positive correlation and trends between changes associated with heart remodeling and the number of TH+ fibers within the cervical VN.

016 – **Giving a leg up: Development of canine pelvic limb models as learning tools.**

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A combination of teaching modalities produces better learning. Anatomical models serve to augment students' learning and are helpful in conjunction with cadaveric dissection, especially when the number of cadavers available is not adequate. Ten canine pelvic limb models were prepared using the Elnady-Technique. The limbs were embalmed using a 10% formaldehyde solution and were injected with blue and red latex. By injecting red latex into arteries and blue latex into veins, the vascular system within the limbs was clearly visualized, enabling students to develop a comprehensive understanding of blood supply and drainage dynamics. To obtain a realistic appearance, the skin of the limbs was incised and reflected without detachment, and a zipper was affixed to the skin. This allowed students to practice various orthopedic approaches by unzipping the skin and identifying structures encountered during surgical procedures. Following the steps of the Elnady technique, encompassing dehydration with acetone, impregnation with glycerin, and curing with cornstarch, the models were exceptionally well-preserved, flexible, and highly informative. Labeled tags enhanced the specimen's educational value, aiding self-testing and identification of anatomical components. The models were always available in the anatomy lab, providing unrestricted access to students. Compared to 2D illustrations, the three-dimensional models offered a more realistic representation of canine pelvic limb anatomy, facilitating spatial understanding and overall comprehension. In summary, the development of canine pelvic limb models utilizing the Elnady-Technique presented a highly effective and ethical substitute for traditional cadavers in the realm of veterinary anatomy education. These models offered a hands-on and realistic learning experience, facilitating students' development of a comprehensive understanding of the intricate anatomy of a canine pelvic limb.

017 Development of the American Association of Veterinary Medical College Guidelines for the Use of Animals in Veterinary Education

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In July 2021, the AAVMC Board of Directors established a task force on the use of animals in veterinary education with the charge of developing recommendations. The task force consisted of representatives from nine member institutions and recommended the development of guidelines regarding animal use. The task force used an iterative consensus-building approach in developing the guidelines over a 12-month period. Once drafted, they were shared with member institutions during an open commenting period, after which comments were considered and edits were made. The AAVMC Board approved the guidelines in October 2022 and published them online. The guidelines aim to support the use of animals in a way that is humane and welfare appropriate and is guided by the 4 Rs: replacement, reduction, refinement, and respect. Cadaver and live animal use is covered, as is their use in meeting educational outcomes and the utilization of alternatives when appropriate. Institutions are encouraged to demonstrate transparency by reviewing, presenting, and discussing information about the sourcing internally. The task force is now preparing an open-access online handbook to accompany the guidelines and is working with co-authors to share best practices, with expected publication in Spring 2024. The guidelines for the use of animals in veterinary education have been written, and should be interpreted, as guiding principles and are not meant to be prescriptive. Individual institutions are encouraged to interpret the guidelines with due regard to their own unique institutional, regional, and national circumstances.

www.aavmc.org/resources/use-of-animals-in-education/

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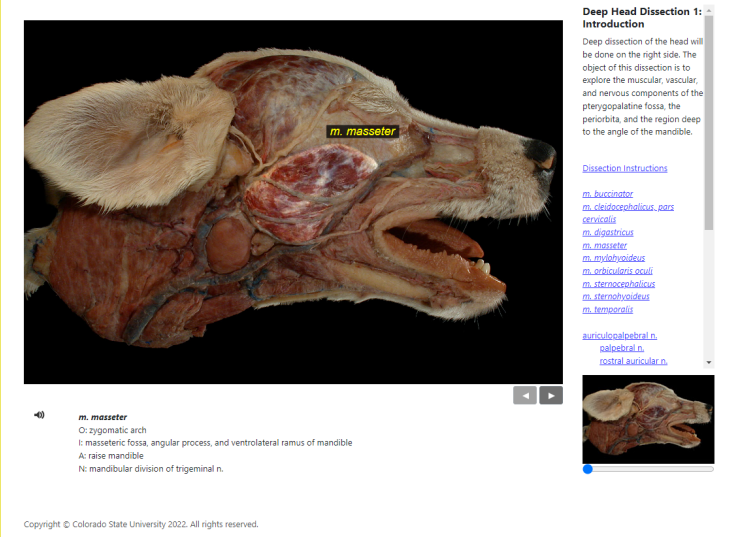

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