DES MOINES UNIVERSITY
MEDICINE & HEALTH SCIENCES

Open to All Students, Faculty and Staff

RESEARCH SYMPOSIUM

Thursday, November 30, 2023

Schedule of Events

11- 11:10AM   **Welcome/ Introduction of Dr. Mishra**   **Dr. Angela Franklin**

E4117 and E4119

11:10-11:45AM   **Keynote Speaker**   **Dr. Pravin Mishra**

View to the Future: Bench-to-Bedside Research at DMU

E4117 and E4119

11:45-12:15PM   **Break (pick up lunch)**

Hallway outside E4117 and E4119

Presentation Breakout

First Poster Session		**Time: 12:15-1:45PM**
breakouts for groups **1-4**		Each group gets 40 minutes to present
Group 1 – Room E4110	Biomedical - Posters 1-10	12:15 -12:55PM
Group 2 – Room E4118	Biomedical – Posters 11-14, 16-20	12:15 -12:55PM
Group 3 – Room E4110	Biomedical – Posters 21-26 Movement Science -Posters 27-30	1:05- 1:45PM
Group 4 – Room E4118	Education – Posters 31-36, 75	1:05- 1:45PM
Break (snack)	**Hallway outside E4117 and E4119**	**1:45 – 2PM**
Oral Presentations	**E4117 and E4119**	**Time 2-3:00PM**
Second Poster Session		**Time: 3-4:30PM**
breakouts for groups **5-8**		Each group gets 40 minutes to present
Group 5 - Room E4110	Anatomy – Posters 46-48, Clinical – Posters 67-73	3-3:40PM
Group 6 - Room E4118	Anatomy – Posters 49-58	3-3:40PM
Group 7 - Room E4110	Clinical – Posters 59-66 Education – Poster 37-38	3:50-4:30PMt
Group 8 - Room E4118	Public Health - Posters 39-45 Biomedical – Poster 15, 76 Anatomy – Poster 74	3:50-4:30PM
Awards/Closing Program	**E4117 and E4119**	**4:30 -5:00PM**

Room E4109

Room E4111

Room E4117

Room E4110

Room E4118

Room E4119
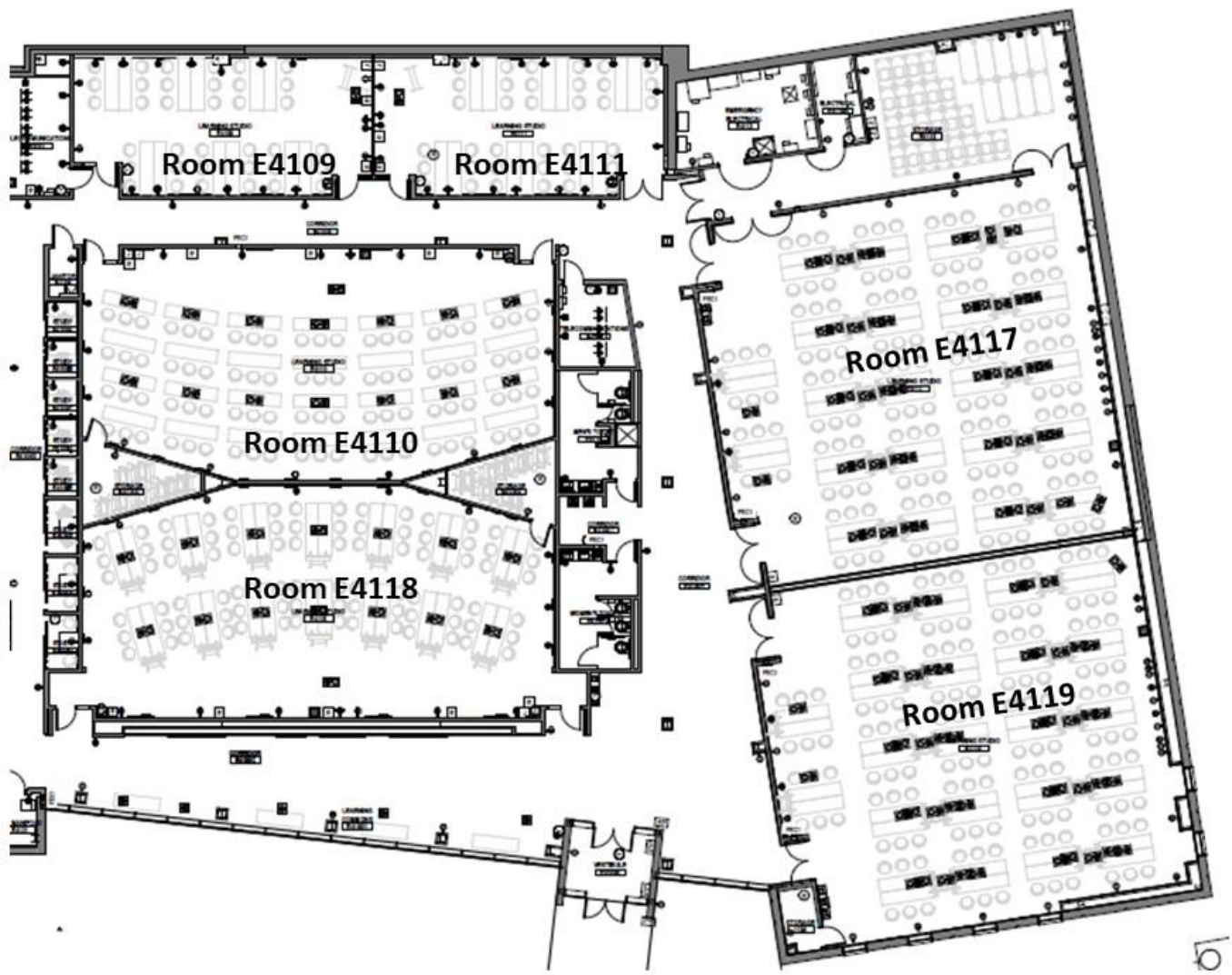
WELCOME TO THE DMU

RESEARCH SYMPOSIUM

The Des Moines University Annual Research Symposium is a forum for student and faculty scholars to present what they have learned and discovered through their research experiences and to engage the larger community in discussion on cutting-edge health topics through poster displays and podium presentations.

This year, the research symposium is open to DMU faculty, staff and students. A Zoom webinar is also available for alumni, external researchers, health professionals and members of the medical and scientific community in the region. The event allows us to celebrate the success of student and faculty scholars whose work demonstrates the critical role research plays in advancing health care and producing new hypotheses.

DMU's core research vision is to cultivate distinctive scholars who collaboratively generate, apply and integrate new knowledge. This year, the symposium is in-person and showcases 6 oral and 76 poster presentations, a keynote speaker and an award ceremony. The oral and poster presentations will cover topics in anatomy and paleontology, biomedical science, clinical research, movement science, public health and education research in the health sciences. As the keynote speaker and executive director of research at DMU, I will present on the topic, "*View to the Future: Bench-to-Bedside Research at DMU.*"

We are pleased you are joining us for DMU's 2023 Research Symposium. This will be my first DMU research symposium — and the first one at the new campus. Our university proudly honors its multifaceted mission to improve lives in our global community by educating diverse groups of highly competent and compassionate health professionals. Our 14th symposium year is an extraordinary milestone demonstrating our continuous commitment to research and scholarship in all its forms. Thank you to all the presenters for sharing their work and to students, faculty, staff and collaborators for joining us today for this special event.

Pravin J. Mishra Ph.D., M.B.A.
Executive Director of Research

Des Moines University

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The 2023 DMU Research Symposium is made possible by the efforts of:

OFFICE OF RESEARCH & SYMPOSIUM PLANNING COMMITTEE
- Pravin J. Mishra Ph.D., M.B.A.- Executive Director, Research
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- Laura Delaney, MPAS, PA-C

SYMPOSIUM ORAL/POSTER JUDGES

Elitsa Ananieva -Stoyanova	Sarah Clayton	Tracy Porter	Vassilios Vardaxis
Maria Barnes	Laura Delaney	July Ronnebaum	Eric Wauson
Kevin Carnevale	Francesca Di Sole	Martin Schmidt	Kathleen Weiss
Michael Carruthers	Rachel Dunn	Kim Tran	Sarah Werning
Dan Christian	Shannon Petersen	Carolie VanSickle	LiLian Yuan

KEYNOTE ADDRESS

View to the Future: Bench-to-Bedside Research at DMU

Pravin J. Mishra Ph.D., M.B.A.
Executive Director of Research at DMU

Dr. Mishra is a seasoned and accomplished researcher having successfully advanced preclinical, clinical, translational and precision medicine programs with a strong focus on cancer genomics, stem cell biology, cell therapy and developmental therapeutics. He is a recognized subject matter expert in general oncology, stem cells, cancer genomics, drug discovery and therapeutics.

Dr. Mishra conducted extensive research at the National Cancer Institute, National Institutes of Health, Rutgers University and Bhabha Atomic Research Center. Dr. Mishra is a noted and widely published clinical innovator, with significant discoveries and IP in oncology, molecular biology, health sciences, public health and a passion for saving lives through precision medicine. Dr. Mishra has documented success in developing new ideas and promoting innovation in the company to develop new business opportunities.

His awards include:

- Excellence in cancer research from NIH D
- NCI Director's Innovation Award
- Gallo Award for Research Excellence
- Scientific Excellence Award for Outstanding Cancer Research from The State of New Jersey Commission on Cancer Research
- Aflac Incorporated - American Association for Cancer Research, Scholar-in-Training Award

Dr. Mishra holds a Ph.D. in Molecular Medicine from George Washington University and an M.B.A. in strategy and leadership from The Ohio State University.

PRESENTATION FORMATS

ORAL PRESENTATIONS

During the podium presentation, presenters will present a 5-minute talk with a 3-minute Q&A. Presenters will speak for the allotted time and take questions from audience members once the talk has concluded. Time keeping and other instructions will be provided to presenters prior to the session. A panel of judges will evaluate the oral presentations for scientific merit and presentation quality. The three highest evaluations will receive 1st, 2nd, and 3rd place recognition.

POSTERS

Poster sessions will be held throughout the symposium. Poster sessions allow presenters to present their research with key excerpts from the findings displayed on large boards. The audience can circulate and stop to discuss topics of particular interest with the presenters. Presenters should be present by their posters in order to answer questions and describe their research to interested audience members. Poster judges for assigned posters will be around to evaluate posters and ask questions of presenters during the time period specified on the program of events. Presenters should be present by their posters during the judging period in order for their poster/presentation to be evaluated. A panel of judges will evaluate the posters and presentations for scientific merit, poster, and presentation quality.

An outstanding poster presentation will be recognized from each of these categories: Anatomy/Paleontology, Biomedical Research, Clinical Research, Educational Research, Movement Science, Public Health.

HOW TO READ A POSTER ABSTRACT
A common approach for evaluating posters involves considering the following factors in the technical and visual categories. This tool can be used when reviewing posters at this meeting and as a helpful guide for constructing your posters in the future.

Category
Technical
Research topic clearly described with adequate introduction and a clear hypothesis.
Good use of the space of the poster with sections on methods, results, and discussion as appropriate.
Conclusion section which emphasizes the relevance of the research in the field of study.
Visual
Title, author(s), and affiliations included.
Poster design logical and easy to follow with appropriate visuals (methods, results, etc.).
Text easy to read, understand, and free of errors.
Graphics clearly contribute to the overall presentation.
Poster is self-explanatory.
Presenter
Able to communicate in-depth technical information in an easy-to-understand manner.
Able to interpret the data properly and clearly answer questions related to project.
Recognize limitations of the project's procedures.

ORAL PRESENTATIONS

Category Presenting Author(s) in Bold. G = Graduate U = Undergraduate F = Faculty/Staff	Poster No.	Page
## CLINICAL		
Neck pain associated with headaches attributed to rhinosinusitis: an observational study **Shannon M. Petersen, PT, DScPT, OCS Emeritus, FAAOMPT, Professor**[1], B O'Halloran, B O'Halloran, DPT, DScPT, SCS, OCS, FAAOMPT, Assistant Professor[2], B Swanson, PT, DSc, OCS, FAAOMPT, Associate Professor[3], A Luth, DPT, Physical Therapist[4], K Learman, PT, PhD, FAAOMPT, Professor[5]	1F	50
Biallelic Optic Atrophy (*OPA1*) Related Disorder – Case Report and Literature Review **Jia Ern Ong DO '25**[1], Bayan Al Othman MD[2], Alina Dumitrescu MD[3]	2G	49
Blood pressure cuff size accessibility for larger-bodied patients in physical therapy settings **Kaylee Gerdts SPT**[1], Tracy Porter PT, DPT, EdD[1], Shannon Petersen DScPT, OCS Emeritus, FAAOMPT[1],	3G	45
## BIOMEDICAL SCIENCE		
A loss of branched-chain aminotransferase (BCAT) enzyme function enhances T regulatory cell lineage commitment **Tanner Wetzel, MPH, DO/PhD '27**[1], Elitsa Ananieva, PhD[1]	4G	41
Leveraging virtual containers for high-powered, collaborative AI research in radiology **Lucas Aronson, DO '26**[1,2], John Garrett, PhD[2], Andrew L. Wentland, MD, PhD[2,3,4]	6G	25
## PUBLIC HEALTH		

Race and poverty as confounders for increased antihypertensives in NHANES 2013-2020 respondents	7G	59

Isabella Dunt, DO/MSA ' 25[1], Jonathan Kertich, DO '25[1], Jesse Chan DO '25[1], Brian
Dankle, DO '26[1], Maria Barnes, PhD [1]

POSTER PRESENTATIONS

Category **Presenting Author(s) in Bold.** G = Graduate U = Undergraduate F = Faculty/Staff	Poster No.	Page
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Saquinavir Increases Phosphorylated Eukaryotic Elongation Factor 2 (peEF2) at the Anal Transition Zone in Transgenic Mice **G. Bartelt DO '26**[1], L.C. Gunder MS[2], S. Haggerty[3], E. Yao BS[2], T.H. Moyer BS[2], H. Johnson MD[2], K. Smith BS[4], N. Sherer PhD[4], E.H. Carchman MD[2,4]	1G	26
Artichoke: An Artist to Choke Cervical Cancer by Downregulation of Cyclin D and Bcl-2 **William F. Chadwick DO '25**[1], Tianyun Guan MD[2], Paris M. Fang[3], Christian Nelson[3], Trent Mayberry[3], Braydon Cowan[3], Mark R. Wakefield MD[3,4], Lijun Dong MD[2], Yujiang Fang MD PhD[1,3,4]	2G	27
Glutamate receptor dysregulation during protracted withdrawal from intermittent ethanol vapor in rats **Daniel T Christian PhD**[1]	3F	27
Wild Jujube, A Welcomed Possibility for Pancreatic Cancer Treatment **Cole Formslag DO '26**[1], Trent Mayberry[2], Samuel Rogers[2], Braydon Cowan[2], Harrison Luechtefeld[2], Caleb Miller[2], Qian Bai[2], Mark R. Wakefield MD[2,3], Yujiang Fang MD, PhD[1,2,3]	4G	28
Components of calcium signaling in autophagy **Jennifer Giles MA**[1], **Abel Ferow MBS ' 27**[1], and Quang-Kim Tran, MD, PhD[1]	5F	28
A novel vasorelaxing peptide derived from the G Protein-coupled Estrogen Receptor 1 **Marcos Gonzalez MSBS '24**[1], Sarah Clayton PhD[1], Jennifer Giles MA[1], Daniel Christian PhD[1], Eric Wauson PhD[1], Quang-Kim Tran MD, PhD[1]	6G	29
Isolation and characterization of three bacteriophages targeting *Acinetobacter baumannii* AB5075 **Tenly Hansen MSBS '24**[1], Carolyn Moore MS[1], Michael Carruthers PhD[1]	7G	29
Identify loci, genes, and DNA regions associated between Eating Speed and DNA Hydroxymethylation: A Scoping Review	8G	30

Bruce Hsieh DO '26 [1], Jun Dai MD MSc, PhD [2, 3]

Exploring the expression of the oncogenes KIT, KRAS, and NRAS as potential targets in testicular cancer therapy. **Alec Jackson DO '26**[1], Elitsa Ananieva PhD[1]	9U	30
The Green Magic Vegetable Spinach Turns on Green for Cervical Cancer Treatment **Kesiya Johnson DO '26**[1], Tianyun Guan MD[2], Trent Mayberry[3], Braydon Cowan[3], Luke Smith[3], Qian Bai[3], Mark R. Wakefield MD[3,4], Lijun Dong MD[2], Yujiang Fang[1,3,4]	10G	31
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THC supplementation results in weight loss and sex-dependent gut microbiota changes **Avi Kaye DO '26**[1], Matthew Rusling DO[1], Ken Mackie MD[2], LiLian Yuan PhD[1]	12G	32
Oncogenes MYC, MAX, and MNT upregulate branched chain amino acid metabolism in peripheral T cell lymphoma **Taha Khan, DO'26** [1], Elitsa Ananieva, PhD [1]	76G	33
St. John Wort sensitizes bronchial epithelial cells to radiotherapy by upregulation of P21 and BAX **Benjamin King DO '26**[1], Lei Zhao[2], Tej Patel[3], Ben Zeh[3], Braydon Cowan[3], Trent Mayberry[3], Qian Bai BA[3], Mark R. Wakefield MD[3,4], Yujiang Fang Md, PhD[1,3,4]	13G	33
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Estrogen influences voluntary wheel running behavior in female rats **Victoria Mathis PhD '26**[1], Merna Mohamed PhD '25[1], Kristin Tefft BS[1], Sarah Clayton PhD[1], LiLian Yuan PhD[1]	17G	35
Exploring variability in stress-induced persistent physical activity: an examination of individual and sex differences **Merna Mohamed PhD '25**[1], Victoria Mathis PhD '25[1], Trevor Buhr PhD'24[2], Carter Reed PhD '23[2], Kristin Tefft BS[1], Peter Clark PhD[2], Sarah Clayton PhD[1], Li-Lian Yuan PhD[1]	18G	36

MOVEMENT SCIENCE

Blake Coughenour DPT '24[1,] Tracy Porter PT, DPT, EdD[1] Shannon Petersen DScPT, OCS Emeritus, FAAOMPT[1]		
A new look at the dynamic measurement of foot arch stiffness during gait **Zachary Katzman DPM '26**[1], Robert Yoho DPM[1], Vassilios Vardaxis PhD[2,3]	29G	57
The effects of protein and carbohydrate supplementation, with and without creatine, on occupational performance in firefighters Kaia Elstad[1], **Conley Malone DO '26**[2], Joel Luedke LAT[3], Salvador J. Jaime PhD[1], Ward C. Dobbs MS[1], Thomas Almonroeder DPT, PhD[4], Chad M. Kerksick PhD[3,5], Adam Markert[6], Andrew R. Jagim PhD[1,3]	30G	58

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"Even I can do AI!" Some examples of machine learning in aiding medical education and clinical practice. **Matthew Brooke DO'26**[1], Daniela Frankova MD, PhD, FACP[2], Teresa Aoki MD[2], Julie Ronnebaum MPT, GCS, DPT, PhD[3], Marc Wachtfogel PhD[4], Leslie Wimsatt PhD[5], Ariel 74 Gubatina MS[1], Donald Matz PhD[1], & Muhammad A. Spocter PhD[1]	31G	52
Mixed methods analysis of diversity and equity education: Perspectives from third year medical students **Brianna A. Desharnais, DO '26**[1], Abigail M. Eastman DO '26[1], Julia Van Liew PhD[1]	32G	52
Learning goals, outcomes, and impactful course elements in diversity, equity, and inclusion education: A mixed methods analysis **Abigail Eastman DO '26**[1], Brianna Desharnais DO '26[1] and Julia Van Liew PhD[1]	75 G	53
Addressing the gap: didactics on health care disparities by medical students in their Internal Medicine core rotation **Daniela Frankova MD, PhD, FACP**[1], Teresa Aoki MD[1]	33F	53
The influence of psychiatry clerkship's setting and nature on students' attitudes and empathy towards patients with mental illness **Leana Frankul DO '26**[1], Chunfa Jie PhD[1], Julia R. Van Liew PhD[1]	34G	54
Ultrasound education at Des Moines University **Hirali Kadakia DO'26**[1], Kevin Carnevale MD[1], John Fell DO[1]	35G	54
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Non-Hispanic Black women face staggering hypertension rates and ineffective treatment outcomes **Chelsea Cuervo-Fernandez DO '26**[1], Maria Barnes PhD[1]	39G	59
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ANATOMY/PALEONTOLOGY

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Using machine learning to segment and quantify the neuropil space in the brain of the North American beaver (*Castor canadensis*) **Juliana Bourne DO '26**[1], David Cain[1], Kathleen Bitterman BS[1] and Muhammad A. Spocter PhD[1,2,3]	47G	19
Assessing the reliability of kerf floor shapes in predicting saw types for use in forensic dismemberment cases **Ann L. Braverman DO '26**[1], Meghan M. Gast MSA '25[1], and Heather Garvin PhD[1]	48G	20
Comparing soft versus bony upper airway dimensions between populations of different climates **Jason D. Crumb MSA/DO '26**[1]; Lauren Butaric PhD[1], Todd Yokley PhD[2]	74G	20
Frontal bone shape and sinus size across US based populations. **Colton Dee OMS-II**[1], Lauren N. Butaric, PhD[1]	49G	21
Anatomical study of the anterolateral ligament of the knee: prevalence in embalmed cadavers **Leif Ericksen** DO '26[1], Donald Matz PhD[1]	50G	21
Comparing CT scout and simulated radiographs on reliability of frontal sinus measurement **Sydney Gates DO '26**[1], Lauren Butaric, PhD[1]	51G	22
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Exploratory analysis of the neuropil space in the somatomotor, visual and cingulate cortex of the extinct Tasmanian tiger (*Thylacine cynocephlus*) **Rachna Sahasrabudhe DO'25**[1], Paul R. Manger PhD[2], Chet C. Sherwood PhD[3] and Muhammad A. Spocter, PhD [1,2]	55G	23
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Allograft reconstruction of a chronic tibialis anterior rupture Maria Pattschull DPM '25[1], **Jade Moravec DPM'25**[1], Kaarin Quaerna BS DPM'25[1], Jared Eddy BS DPM'25[1], Sean T. Grambart DPM, FACFAS[1]	71G	49
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ABSTRACTS

ANATOMY/PALEONTOLOGY

3D segmentation of the brain of the domestic goat (*Capra hircus domestica*): Comparative white matter, grey matter, and subcortical volumes ♦ 46 G ♦

Nathan Albanito DO '26[1], Nathan E Garner[1], Eric W. Rowe DVM PhD[2], Cheuk C. Tang[3] and Muhammad A. Spocter PhD[1,2]

[1]*Department of Anatomy, Des Moines University, Des Moines*
[2]*Department of Biomedical Sciences, Iowa State University*
[3]*Department of Radiology, ICAHN School of Medicine, Mount Sinai NY.*

Over the last 10 years there has been increasing interest in the cognitive abilities of domestic species. Domestic goats have received much attention given their remarkable abilities to read human communicative cues which parallel observations also seen for other domestic species such as dogs. This shared behavioral trait is suggestive of a convergence in morphology between the domestic Artiodactyla and Canidae. Using high resolution magnetic resonance imaging aimed at providing much needed quantitative insight to these behavioral observations, we quantified select cortical and subcortical structures in the goat brain. Scanning was performed on one postmortem brain specimen and resultant white matter; grey matter and subcortical limbic structures were manually segmented before being compared through allometric analyses with published mammalian data.

Using machine learning to segment and quantify the neuropil space in the brain of the North American beaver (*Castor canadensis*) ♦ 47 G ♦

Juliana Bourne DO '26[1], David Cain[1], Kathleen Bitterman BS[1] and Muhammad A. Spocter PhD[1,2,3]

[1]*Department of Anatomy, Des Moines University, Des Moines*
[2]*School of Anatomical Sciences, Faculty of Health Sciences, University of the Witwatersrand, Republic of South Africa;*
[3]*Department of Biomedical Sciences, Iowa State University Vet Med.*

The North American beaver (*Castor canadensis*) is a large rodent species native to North America. Like most rodents, beavers have smooth (lissencephalic) brains however, this external organizational simplicity is contradicted by their apparent behavioral complexity (e.g., dam building), raising the question as to how beavers can perform these complex tasks with such diminutive brain organization. To address this question and develop an approach which could be readily acquire cell profiles in this understudied species, we surveyed the neuropil space (a proxy for cortical connectivity) using a combination of design based stereological sampling and machine learning. A sub sample consisting of image stacks of the frontal and visual cortex of the beaver brain were manually labelled and four models were developed and trained using varying sampling parameters. The resulting output from each model was then visually compared for accuracy to select the most

optimal model for use. The results of this pilot study are discussed in consideration of the feasibility, accuracy, and challenges to ongoing analysis of the beaver cortical surface.

Assessing the reliability of kerf floor shapes in predicting saw types for use in forensic dismemberment cases ♦ 48 G ♦

Ann L. Braverman DO '26[1], Meghan M. Gast MSA '25[1], and Heather Garvin PhD[1]

[1]Department of Anatomy, Des Moines University, Des Moines

Forensic anthropologists commonly assess the floor shapes (kerf) of the bony cuts left by saws in cases of human dismemberment. Kerf shape is thought to reflect characteristics specific to the class of saw utilized to make the cuts. In this study, a set of 12 kerf shape categories was created based on previous studies and observations. These categories were used to test interobserver agreement of kerf floor assignments and in the evaluation of the kerf shape/saw characteristic relationship. This research utilized a 90-specimen subsample of incomplete saw cuts on fully macerated human long bones made available by Mercyhurst University and originally collected as part of a National Institute of Justice grant project (2005-IJ-CX-K016). The 19 saws used to make these cuts were semi-randomly selected to ensure approximately equal representation of each saw. Stereomicroscopic photos of the kerf profiles from these 90 specimens were scored by three observers. Agreement between the two inexperienced observers and the experienced observer was 60.0% and 75.6% for the 12-shape scoring system. Collapsing the kerfs with flat or slightly rounded floors increased agreement to 90.0% and 88.8%. Other than being made by rip saws, no patterns were discerned between the flat/rounded kerf floors and saw characteristics. Kerfs with a "W" or truncated-"W" shape had 100% agreement across all observers. All but one of the W-shaped kerfs were created by hand saws with alternating crosscut teeth. This preliminary research highlights the utility of kerf floor shape analysis and illustrates the need for further kerf floor shape assessment.

Comparing soft versus bony upper airway dimensions between populations of different climates ♦ 74 G ♦

Jason D. Crumb MSA/DO '26[1]; Lauren Butaric PhD[1], Todd Yokley PhD[2]

[1]Department of Anatomy, Des Moines University West Des Moines, IA
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Differences in airway passages lead to a multitude of different impacts on the way humans breathe. Mainly, longer, narrower, and taller pathways lead to more air turbulence compared to their smaller counterparts. This results in humidification and heating of air prior to its arrival in the lungs. Our research looked at how human airway passages differ between populations that originate from different climates. I worked with 3DSlicer 5.2.2 to orient 3D imaging of subjects' skulls (n = 41) into Frankfort Horizontal position and interpolate them with 2D images of the soft tissues. I then plotted 12 midline landmarks including bony and soft tissue portions of the nasal cavity, nasopharynx, and oropharynx. We ran linear regressions of nasal dimensions against the functional soft tissue nasal length (external nasal tip to posterior nasopharynx). Ultimately, we found females had smaller airways compared to males, as expected given their smaller builds on average. Compared to European females, African females tended to have longer nasal cavity and nasopharynx lengths (anterior nasal spine to C1) but shorter soft-tissue nasal lengths in the nose (nasal tip to anterior nasal spine) relative to their functional soft tissue nasal length. African vs European nasal dynamics in males could not be assessed due to small sample sizes. Future studies will need to utilize a larger sample size and imaging of the laryngopharynx.

Frontal bone shape and sinus size across US based populations. ♦ 49 G ♦

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Human facial sinus cavities have long been a mystery bringing about many questions—particularly regarding individualistic and group variation in structure. This study was performed to determine if frontal sinus volume correlates specifically with midline frontal curvature, which has been suspected in the literature. This research specifically investigated how the frontal sinus varies with skull size and shape, on genetically determined sex and ancestral origins. Using Slicer3D, skull shape and midline frontal bone curvature was measured via landmark and principal component analyses (PCA) and compared to pre-collected frontal sinus volume in a total of 233 pre-formed 3D skull models: Smithsonian Institute Terry Collection n=113 (African Female=22; African Male=39; European Female=18; European Male=34) and New Mexico Descendent Image Database n=120 (African Female=30; African Male=30; European Female=29; European Male=29). Analyses comparing sinus volume and midline frontal bone curvature showed no significant correlation. However, data trends for sex and ancestry differences in frontal bone shape were noted. Males had more prominent supraglabellar depression in midline curvature compared to females (PC1: t=6.77, p<.001). Individuals of African descent had more rounded frontal bones, while Europeans had flatter frontal bones (PC3: t=7.53, p<.001). These findings depart from the proposed assumption of larger supraglabellar depression correlating with smaller frontal sinus size, indicating the need for further investigation into what may be driving frontal sinus size. This study and others in its field pose theoretical uses in the fields of osteoarchaeology, forensics, and potentially in the management of sinus related conditions with medication treatment and surgery.

Anatomical study of the anterolateral ligament of the knee: prevalence in embalmed cadavers ♦ 50 G ♦

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The anterolateral ligament (ALL) of the knee was first referenced by a French surgeon in 1879 but was not referenced in anatomical literature until 2013. Studies on it have increased significantly the last 2 years. The ALL is a deep ligament on the lateral aspect of the knee. There is some discrepancy about its origin. Most agree that it is anteromedial to or under the origin of the lateral collateral ligament (LCL) sharing fibers on the lateral femoral epicondyle. The ligament courses obliquely in an anteromedial direction fanning anterolaterally distally. It has been described as attaching on the tibia between Gerdy's tubercle and the LCL insertion on the fibula. Along its course, the ALL has an attachment to the lateral meniscus which makes it a possibly significant structure in orthopedics. Also relevant for orthopedic surgery is the growing evidence that the ALL has a significant role as a secondary stabilizer to the anterior cruciate ligament. Since its discovery, there have been various studies that have explored the prevalence of the ALL in the general population. Cadaveric studies done in Japan, India and Belgium have found the percent prevalence of the ALL in their cadaveric studies to be over 90%. Shetty et. Al. from India described four different shape variations including cord, band, mixed and Y-shaped types. This study looked specifically for the cord type in 70 preserved knees. A distinct ALL in 37 knees for a prevalence of 52.86%, compared to 69.04% in the study from Shetty et al.

Comparing CT scout and simulated radiographs on reliability of frontal sinus measurement ♦ 51 G ♦

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Uniqueness of frontal sinuses can be used as a distinguishing factor for post-mortem identification. Post-mortem studies must be reliably matched to previous antemortem imaging done on the individual, even if that imaging is from different machines. Thus, it is critical to be able to accurately relate CT scans and radiographs. To verify the repeatability of measuring the frontal sinus, dimensions between both imaging modalities and measurers were analyzed. In order to compare this, 3DSlicer was used to compile CT images from 15 individuals into simulated radiographs. Eight measurements were taken from these radiographs and compared to the measurements gathered from the scout images from each CT scan. A paired-t test was performed to compare intraobserver data, i.e., data collected by the same observer from the same images, interobserver data, i.e., data collected by two separate observers on the same images, and intermodality data, i.e., data collected by the same observer on images of the same individual in two different imaging modalities. Intraobserver data was not statistically different (p>0.05). However, interobserver error showed differences between maximum breadth of the sinus (p=0.010) and a measure of left sinus breadth (p=0.04). Similarly, intermodality error showed a significant difference between maximum breadth (p=0.023) and a measure of right sinus breadth (p<0.001). These measurements likely differ because of a single outlier individual, but all other measurements were not significantly different. This shows reliability in certain measurements between imaging modalities, but there is a margin of error that may impact current post mortem identification.

A description of the hindlimb of *Miracinonyx trumani* with implications for its ecological niche ♦ 52 G ♦

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Miracinonyx trumani was a species of felid that lived during the late Pleistocene across North America. It has been called the 'American Cheetah' due to its morphological similarities with the African cheetah *Acinonyx jubatus,* and because of those similarities it has been thought to be primarily a cursorial animal. Previous studies of *M. trumani* have described the cranium and the forelimb or have described the skeleton of juveniles; no studies have yet described the hindlimb in adults. We completed this study to better understand the ecological role of the American cheetah in the Pleistocene ecosystem.

We analyzed the hindlimb of *M. trumani*, *Puma concolor*, and *Acinonyx jubatus* using 3D models made from CT scans. Our results indicate *M. trumani* hindlimbs have several adaptations for a cursorial lifestyle that it shares with the African cheetah. These include an innominate with a well-defined ischial tuberosity, a curved tibia, and a pronounced neck of the femur. It also has some traits that more closely resemble the scansorial *Puma*, including the distal articular surface of the femur with a matching tibial plateau, however, some of these characters were modified secondarily for speed, such as an enlarged tibial crest as in the cheetah, which would increase the lever arm of the quads. Additional characters not optimal for cursoriality include a shallower malleolar mortise with less well-defined articular surfaces for the trochlea of the astragalus. This mix of traits means that *M. trumani* was more adapted to a cursorial lifestyle than its sister species *Puma concolor*, but was not likely to be as cursorial as the *A. jubatus*.

Finite Element Analysis (FEA) Reveals Increased Force Used by the Forelimbs in the Sabertoot Cat, *Smilodon fatalis* ♦ 53 G ♦

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The sabertooth cat, *Smilodon fatalis*, was a carnivorous predator that lived during the Ice Age, or Pleistocene Epoch 2.5 million to 11,000 years ago. Unlike modern cats that kill their prey with a suffocating bite to the windpipe, sabertooth cat teeth were too fragile for this method of prey-killing. Sabertooth cats were known to have muscular forelimbs to hold prey down before delivering a fatal bite to the neck viscera with their large saber canines. Morphological specimens were measured and analyzed using finite element analysis technology, an engineering technique that utilizes the material properties of solids to stimulate stress and strain in the material of interest. Bone tissue of the the humerus was used to compare the stress and strain potential of the sabertooth cat, *S. fatalis*, to living large cats.

We leveraged heterogeneous finite element (FE) models generated with species-specific material properties to assess the strength of *S. fatalis'* forelimbs in prey-holding posture. Results indicate S. fatalis had the strongest overall forearm strength compared to pantherines, exceeding that of lion (*P. leo*), leopard (*P. pardus*), jaguar (*P. onca*), and was most similar to tiger (*P. tigris*). These findings are consistent with the inference that sabertooth evolution involved widespread modification and coordination of musculoskeletal performance in increasingly specialized forms.

Diffusion Tensor Imaging of the Carnivora Brain: A Pilot Study ♦ 54 G ♦

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Fiber tractography is relatively novel method for reconstructing the course and location of white matter tracts in the mammalian brain. While this approach has been applied extensively in human studies, very few studies have looked at the application of this approach to the study of non-traditional animal models. Here we look to explore the use of fiber tractography to reconstruct the major commissural, association and projection fiber pathways in a range of closely related Carnivora. The null hypothesis is that fiber pathways in closely related species of carnivora have remained largely unchanged and are indicative of the constraints (architectural, developmental, or phylogenetic) that unite species within a given Order. Alternatively, deviations from this known bauplan are interpreted as species specific variation, which is directly related to the unique ecological context of each species (i.e., hunting strategies, social organization and or cognition).

Exploratory analysis of the neuropil space in the somatomotor, visual and cingulate cortex
of the extinct Tasmanian tiger (*Thylacine cynocephlus*) ♦ 55 G ♦

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The Tasmanian tiger (*Thylacine cynocephlus*) was a carnivorous marsupial which was driven to extinction at the start of the 20th Century. While historical records and genetic data have provided us with some insight into thylacine behavior and relatedness, we still know very little about their comparative neurobiology. Through the recent availability of a high-resolution image dataset acquired from hematoxylin-stained sections of a single thylacine brain, we undertook an exploratory analysis of the cortical microcircuitry in the somatomotor, visual and cingulate cortex. The aim of this study was two-fold, 1) to evaluate if there are regional differences in microcircuitry between cortical areas and to access the quality of the image data for follow-up comparisons with the extant Tasmanian devil (*Sarcophilus harrisii*). Using a design based stereological sampling and image analysis approach, we quantified the neuropil fraction and average cell size in the cortical regions of the Thylacine brain. Our preliminary findings are interpreted within the context of published data on the neuropil space across species and recommendations are made for the use of this image dataset in subsequent histological comparisons.

Validating the Osteoid web tool for skeletal species identification ♦ 56 G ♦

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Determining if remains are human or non-human is the first priority when evaluating an unknown bone; secondary is species identification. The Osteoid web tool was created for public use to aid in species identification. A few measurements, along with photo comparisons, guides the user towards an identification. The tool has been available for use since 2021 but has yet to be tested. The aim of this study is to test the effectiveness of the Osteoid web tool in species identification. The study consists of 56 unidentified faunal long bones recovered from various locations in Iowa. The bones were measured and visually evaluated using the Osteoid web tool. All elements were able to be identified when visual comparison was utilized. Based on measurements alone, Osteoid correctly classified 96%. Those with measurements outside of the posted range included a goose femur and a turkey tibiotarsus. The goose femur measurement is one millimeter outside of the range; this could be a measurement error, or a call to expand the dataset. The turkey tibiotarsus has larger measurements than specified by Osteoid. This could be a domestic turkey rather than wild, giving explanation to its exceptionally large size. Accuracy rate could be improved by adding the measurements of more individual bones to the current dataset, including both domestic and wild specimens for each species. Utilization of measurements in the program is limited to skeletally mature specimens. Overall, however, the program was quick and simple to use for preliminary identifications.

Using machine learning to quantify the cellular and vascular subcomponents of the neuropil space in five regions of the crocodilian brain. ♦ 57 G ♦

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Historically, the study of the reptilian nervous system has received very little attention. Central to this issue, has been ongoing public and scientific misconceptions that reptiles are emotionless and unintelligent. In the following study we provide much needed empirical data on regional and individual variation in the morphology of the neuropil space in the Nile crocodile (*Crocodylus niloticus*). The neuropil space is an important intercellular component supporting the complexity of the cortical column and has been used as a robust proxy for connectional and functional differences. Using a combination of design based stereological sampling and machine learning, we sampled the neuropil space in the stained histological sections of the dorsal thalamus (DT), dorsal ventricular ridge (DVR), optic tectum (OT), torus semi-circularis (TS) and cerebrum (C) of 5 crocodiles ranging in size from 1.2Kg to 10.06 Kg. Mean neuropil space was greatest in DT> C>OT>DVR>TS. Neuropil, cellular and vascular fractions ranged from a high of 73%; 29%; 7% respectively to a low of 60%; 23%; 3%. Aside for the DVR, all other areas seemed to undergo a modest increase in neuropil space with increasing body mass, while the DVR remained constant in terms of its neuropil complement. These preliminary results provide an important step towards validating our approach for automating the extraction of neuropil data from large histological datasets and comparing these within and between species.

Quantitative analysis of the Kudu brain (*Tragelaphus strepsiceros*)   ♦ 58 G ♦

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The Kudu is a member of the antelope family and is relatively understudied from an anatomical perspective. To date, no published studies have detailed the underlying neuroanatomical structure of the Kudu brain or provided 3D segmentation or volumetric data on its subcortical anatomy. Using MRI scan data obtained from a postmortem scan of an adult specimen (male), we provide a preliminary MRI atlas and accompanying 3D reconstructions of the hippocampus and amygdala. These volumetric data were compared with whole brain size using published data on other cetartiodactyla. This project provides an anatomical baseline for comparisons between domestic and wild type artiodactyls and identifying the neuroanatomical substrate supporting complex behavior within this group.

BIOMEDICAL SCIENCE

Leveraging virtual containers for high-powered, collaborative AI research in radiology.   🌟

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Numerous obstacles confront researchers engaged in the advancement of artificial intelligence (AI) models within the field of radiology. The divergence in hardware and software specifications among different researchers poses a substantial hindrance to effective collaboration. Model development within the same lab may also be challenging due to differences in platforms and hardware/software between lab members. Additionally, remotely harnessing the power of GPU-equipped computer servers can lead to compatibility issues and add to these inter-user challenges. Finally, the dissemination of AI models and the ability to download pre-existing AI models are not simple tasks due to the size and complexity of most programs.

Virtual containers offer a solution to such compatibility issues and are integral to the way modern AI development takes place. Virtual containers are software tools that bundle code, required programs, and necessary software packages to ensure that a program runs identically for all users, regardless of their native computing environment. This article outlines the features of virtual containers (compatibility, versatility, and portability) and highlights an applied use-case for virtual containers in the development of an AI model. Although the use-case offered here is specific to AI within radiology, the applications of virtual containers are vast and such tools are becoming increasingly necessary in the world of data science and AI across all fields of research.

Saquinavir Increases Phosphorylated Eukaryotic Elongation Factor 2 (peEF2) at the Anal Transition Zone in Transgenic Mice ♦ 1 G ♦

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Background: A hallmark of cancer development is eukaryotic elongation factor 2 (eEF2) overexpression. Saquinavir (SQV) has shown to prevent tumorigenesis in an HPV mouse model of anal disease. Our goal was to assess peEF2 expression, as a marker of eEF2 inactivation, in mice with or without topical SQV treatment. We hypothesized that SQV treatment would increase peEF2 expression.

Methods: *K14E6/E7* mice with high-grade anal dysplasia that express HPV16 E6/E7 oncoproteins in their epithelium were randomized into treatment groups: no treatment (N = 23), topical 7,12-Dimethylbenz(a)anthracene (DMBA) only (N = 22), topical SQV (2.5%) only (N = 16), and topical SQV with DMBA (N = 10). DMBA use ensured progression of high-grade anal dysplasia to cancer within 20 weeks. At 20 weeks anuses were harvested and Immunofluorescent staining for peEF2 was performed. Tissues were imaged for peEF2 localization at the anal transition (ATZ). Fisher's exact tests (due to sample size) were performed to analyze peEF2 localization.

Results: 11 of 16 samples in the SQV only group showed localized peEF2 staining at the ATZ; a significant increase compared to control where 6 of 23 samples showed localized staining (p=0.01). 9 of 10 samples in the SQV+DMBA group showed localized staining at the ATZ; a significant increase compared to DMBA only where 11 of 22 samples showed localized staining (p=0.049).

Conclusion: Saquinavir increased staining of peEF2 along squamous epithelium at the ATZ, indicating eEF2 inactivation. Further investigation is required to evaluate if this is required for cancer prevention with SQV.

Artichoke: An Artist to Choke Cervical Cancer by Downregulation of Cyclin D and Bcl-2 ♦ 2 G ♦

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Background: Cervical cancer (CC) continues to be one of the leading causes of mortality worldwide. It is estimated that 90% of deaths from CC occur in low- and middle-income countries. Artichoke is a commonly consumed plant that has been studied more recently with increasing interest for its abundance in antioxidants. Our previous study showed that artichoke extract (AE) is a potent inhibitor of melanoma. To extend that study, this study is designed to assess the potential antitumor effects of AE on the SiHa CC cell line.

Methods: Clonogenic survival assay, cell proliferation, and caspase-3 activity kits were used to evaluate the effects of AE on cell survival, proliferation, and apoptosis of SiHa CC cells. Molecular mechanisms were further assessed by using RT-PCR and IHC.

Results: SiHa CC cell colony count significantly decreased in the presence of AE. A decrease in the OD value of CC cells was also found in the presence of AE. The relative caspase-3 activity in SiHa CC cells increased significantly in the presence of AE. The anti-proliferative effect of AE on SiHa CC cells correlated with decreased expression of cyclin D. The pro-apoptotic effect of AE on SiHa CC cells correlated with decreased expression of Bcl-2.

Conclusions: Artichoke inhibits growth of CC through inhibiting proliferation and promoting apoptosis by downregulation of cyclin D and Bcl-2. These findings extend the anti-tumor effect of artichoke from melanoma to CC, supporting the concept that artichoke exerts powerful anti-tumor property in not only one cancer. Such a study may be useful to develop natural treatments for many types of cancers.

Glutamate receptor dysregulation during protracted withdrawal from intermittent ethanol vapor in rats ♦ 3 F ♦

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Functional dysregulation of glutamatergic receptor systems during withdrawal from chronic drug exposure is a primary driver of drug craving and subsequent resumption of drug use. Animal models (psychostimulants) have demonstrated dynamic alterations in both AMPA and NMDA receptor function and expression that contribute to drug seeking behavior. Regulation of these receptor systems can begin as early as a few days following cessation of drug use and are persistently expressed into long term withdrawal (>60d). Short term withdrawal from chronic ethanol exposure induces functional dysregulation of AMPA and NMDA receptors suggesting that similar mechanisms may be regulated across drugs. To this end, we investigated AMPA and NMDA receptor mediated synaptic function during protracted withdrawal (>35d) from chronic intermittent ethanol (CIE) exposure using whole cell patch clamp electrophysiology. We focused on the basolateral amygdala (BLA), as glutamatergic signaling in this region is robustly modulated by short term (24 h) withdrawal from CIE (and regulates anxiety like behavior expressed during withdrawal. Adolescent rats exposed to repeated cycles of CIE (12 hr/day, 4 d on/3 d off, 3 cycles) demonstrated significantly increased functional contributions of NMDA receptors in male but not female animals. TK30, a GluN3 antagonist and ifenprodil, a GluN2B antagonist significantly reduced responses in withdrawal but not control cells. In addition, we have measured an increased

sensitivity to the GluA1 antagonist NASPM, suggesting an increased functional contribution of GluA1-containing AMPARs during protracted withdrawal. Our data support widespread dysregulation of glutamate signaling during protracted withdrawal from ethanol exposure.

Wild Jujube, A Welcomed Possibility for Pancreatic Cancer Treatment ♦ 4 G ♦

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Background: Pancreatic Cancer (PC) is the third leading cause of cancer mortality in the US and continues to increase in occurrence. Wild Jujube (WJ) is a commonly consumed fruit for folk medicine and is rich in phytochemicals such as tannins, flavonoids and alkaloids. Previous studies have demonstrated that WJ possesses anticancer properties. However, few studies have attempted to investigate the anticancer mechanisms of WJ. This study will investigate the effects of WJ on the growth of PC and their potential proliferative or pro-apoptotic mechanisms.

Methods: To determine the effect of WJ on proliferation and apoptosis using WJ extract (WJE), a clonogenic survival assay, cell proliferation kit, caspase-3 activity kit, and TUNEL staining were utilized on the PC cell line, PAN-48. To determine potential molecular mechanisms, RT-PCR and IHC were used on the same PAN-48 cell line.

Results: A decreased colony cell survival count, survivin staining, cyclin D staining, and TUNNEL+ cell count for WJE-treated PAN-48 demonstrated that WJE has an inhibitory effect on PC growth. This is further supported by the increase of caspase-3 activity noted for the WJE-treated group. RT-PCR for the WJE-treated group revealed that pro-proliferative molecule cyclin D and anti-apoptotic molecule survivin were significantly lower than the control group.

Conclusion: WJ showed inhibitory effects on the growth of PC through the downregulation of pro-proliferative molecule cyclin D and anti-apoptotic molecule survivin. Further studies may reveal the therapeutic benefits of utilizing WJ PC therapy.

Components of calcium signaling in autophagy ♦ 5 F ♦

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Macroautophagy (autophagy) is a process that packages and delivers unwanted cellular components to the lysosome for degradation to maintain homeostasis. Autophagy is strongly activated by nutrient starvation, such as found in myocardial ischemia or infarction. Starvation, mimicked experimentally by removal of extracellular amino acids, induces an increase in intracellular Ca^{2+} (operationally, SICS, starvation-induced $\underline{C}a^{2+}$ signal) that is predicted to initiate many Ca^{2+}-dependent activities of autophagy via interactions with its ubiquitous transducer calmodulin (CaM). The transient receptor potential mucolipin 1 (TRPML1) is an important lysosomal Ca^{2+} release channel that participates in organellar fusion and acidification, critical steps of autophagy. We recently showed that CaM is critical for autophagy. However, whether CaM regulates components of SICS and lysosomal Ca^{2+} release via TRPML1 is unknown.

Here, we report that SICS consists of both organellar Ca^{2+} release and extracellular Ca^{2+} entry. Molecular buffering of CaM using a fusion of two high-affinity CaM-binding proteins is associated with substantial increases in both components. Activation of TRPML1 using the agonist ML-SA1 triggers a small Ca^{2+} release signal and a large Ca^{2+} entry signals that are higher with CaM buffering at all ML-SA1 doses tested. Notably, increasing buffering of CaM in a multiplexed imaging system that simultaneously detects the CaM sequesters and measures Ca^{2+} responses is associated with increasingly larger lysosomal Ca^{2+} release via the TRPML1. These data clearly indicate that nutrient starvation triggers increases in intracellular Ca^{2+} via multiple sources and that CaM regulates all its components. The data also suggest that CaM may directly inhibit TRPML1.

A novel vasorelaxing peptide derived from the G Protein-coupled Estrogen Receptor 1   ♦ 6 G ♦

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Store-operated Ca^{2+} entry is required for many endothelial functions, such as the production of nitric oxide. In this mechanism, depletion of ER Ca^{2+} triggers conformational changes in the stromal interaction molecule 1 (STIM1) to promote its interaction with plasma membrane Ca^{2+} channels. Sustained ER Ca^{2+} depletion, however, is associated with ER stress. We recently developed a unique peptide (G2) based on the G protein-coupled estrogen receptor 1 (GPER) that strongly binds the Ca^{2+}-binding loop of STIM1 leading to large conformational changes.

Here, we conjugated G2 with an endothelium-specific leader sequence, aiming to promote endothelial Ca^{2+}-dependent functions without causing ER stress. In *in vitro* testing using a novel STIM1 biosensor, the conjugated peptide (EFG2) directly interacts with the Ca^{2+}-binding loop of STIM1 with 500-fold higher affinity and causes 10-fold greater conformational change therein compared to saturating Ca^{2+}. *In-cell* testing showed that EFG2 triggers Ca^{2+} entry but does not affect ER Ca^{2+} in endothelial cells. EFG2 has no effect in human aortic smooth muscle cells, demonstrating its specificity for the endothelium. In anesthetized rats, intravenous infusion of EFG2, but not a scrambled peptide, causes dose-dependent vasorelaxation. However, when G2 is conjugated to the universal cell penetration sequence TAT, the resultant peptide TFG2 triggers an initial vasorelaxation response followed by rapid vasoconstriction. TFG2 treatment does not increase endothelial ER stress markers BiP or IRE1α or affect voltage-dependent Ca^{2+} current in excitable cells. Thus, EFG2 is a novel vasorelaxing peptide with promising actions to protect endothelial functions.

Isolation and characterization of three bacteriophages targeting *Acinetobacter baumannii* AB5075   ♦ 7 G ♦

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Acinetobacter baumannii is emerging as one of the most challenging bacterial pathogens to manage and treat in hospitals worldwide due to its increasing resistance to all currently available antibiotics. *Acinetobacter baumannii* accounts for 20% of infections across ICUs worldwide, with a mortality rate greater than 50%. Because of its threat to human health, *A. baumannii* is currently classified by the World Health Organization (WHO) as a critical priority pathogen for which new treatment options are urgently needed.

Using bacteriophages to treat bacterial infections, commonly called phage therapy, is gaining interest as a promising alternative treatment option for infections caused by antibiotic-resistant bacteria. However, there are currently only 184 bacteriophages targeting *A. baumannii* with genome sequences that are complete and publicly available. The goal of this research is to isolate and characterize lytic bacteriophages that target the model strain of *A. baumannii* called AB5075.

Three phages were successfully isolated from activated sludge obtained at the Des Moines Metropolitan Wastewater Reclamation Authority. Phage morphology was assessed using transmission electron microscopy. These phages have distinct dimensions, indicating that they are different phages. However, they each exhibit a myophage morphology, possessing icosahedral heads and contractile tails. In the near future, the host range, genome, and growth characteristics of these phages will be characterized.

Ultimately, this research aims to increase our knowledge of bacteriophages that target *A. baumannii* and add to a growing collection of phages for potential therapeutic use against this notoriously antibiotic-resistant pathogen.

Identify loci, genes, and DNA regions associated between Eating Speed and DNA Hydroxymethylation: A Scoping Review　　　　　　　　　　　　　　　　　　♦ 8 G ♦

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Objectives: Previous studies have looked at the association of eating speed and DNA hydroxymethylation with type 2 diabetes mellitus separately. However, there were no reviews synthesizing evidence on specific DNA locations linking eating speed to hydroxymethylation. Thus, we aimed to identify candidate hydroxymethylated DNA regions, genes, and loci associated with eating speed from the literature through a scoping review.

Methods: Using the literature database PubMed, two reviewers independently conducted an exploratory review of the literature and each of them developed one keyword list for eating speed and one for hydroxymethylation. The two reviewers then cross-referenced the keyword list with each other to finalize two sets of the keyword list. The combination of keywords in the two lists was used to search prior studies of the association of eating speed with hydroxymethylation. The searched studies were limited to the English language and published on PubMed prior to August 22, 2023.

Results: A total of 56 keywords for eating speed and 6 for DNA hydroxymethylation were included in the keyword list. Thirty-six studies were found. After reviewing their abstracts carefully, all studies were excluded because none of them investigated eating speed associated with hydroxymethylation.

Conclusion: No specific DNA locations linking eating speed to hydroxymethylation were identified from the PubMed literature, suggesting this is a rarely studied area. Future research will focus on eating speed and methylation.

Exploring the expression of the oncogenes KIT, KRAS, and NRAS as potential targets in testicular cancer therapy.　　　　　　　　　　　　　　　　　　　　　　　♦ 9 U ♦

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The most common malignancy among young adult males is testicular cancer. While chemotherapy is effective for treating testicular cancer, it leaves patients with lasting side effects including peripheral neuropathy, pulmonary fibrosis, and chronic kidney disease. New approaches, such as better understanding of oncogenic expression by testicular cancer may help develop targeted therapies leading to decreased reliance on the highly toxic chemotherapy regimens. This project aimed at improving the understanding of differences in gene expression in three proto-oncogenes - KIT, KRAS, and NRAS within different subtypes of testicular cancer. These genes are required for normal cell division; however, mutagenic events increase their oncogenic capacity. Specimens from patients with testicular cancer were obtained using the public web-based tool R2: Genomic Analysis and Visualization Platform. KIT, KRAS, and NRAS were measured in the unit of 2log gene expression in normal testicular (n=6) and malignant (n=101) tissues. The malignant tissue was separated into seminoma (n=16) and non-seminoma (n=83). Non-seminoma was represented by embryonal carcinoma (n=40), teratoma (n=22), yolk sac (n=170), and choriocarcinoma (n=4). Results showed significant increase in KRAS expression in the seminoma and non-seminoma groups compared to control specimens. KIT was significantly overexpressed in the seminoma group. In contrast, NRAS was significantly overexpressed in the non-seminoma group. When the non-seminomas were separated by subtype, there was increased expression of KIT in the yolk sac tumors but not in embryonal carcinoma or teratoma. These findings suggest subtype-dependent regulation of KIT and NRAS in testicular cancers signifying the importance of exploring oncogenic expression by subtype.

The Green Magic Vegetable Spinach Turns on Green for Cervical Cancer Treatment ♦ 10 G ♦

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Background: Cervical cancer is the most common gynecological cancer worldwide. The dysregulation of CKD4 in the cell cycle is an important factor that leads to the development of cervical cancer. Spinach is a popular vegetable because of its nutritional benefits. Its high glycoglycerolipid and antioxidant content have revealed anti-tumor effects on breast and colon cancers. However, its effect on cervical cancer is unknown. This study was designed to investigate the direct effect of spinach on the growth of cervical cancer.

Methods: We utilized clonogenic survival assay, cell proliferation kit, caspase-3 activity kit and TUNEL staining to examine the effect of spinach extract (SE) on proliferation and apoptosis of the widely studied cervical cancer cell line, SiHa. RT-PCR and IHC were used to further investigate possible molecular mechanisms.

Results: The percentage of colonies of SiHa cancer cells significantly decreased after treatment with SE. In addition, a decrease in the OD value of cancer was noticed. The relative caspase-3 activity in SiHa cancer cells also increased significantly after treatment with SE. The anti-proliferative effect of SE on SiHa cancer cells correlated with decreased expression of CDK4. The pro-apoptotic effect of SE on SiHa cancer cells correlated with increased expression of BAX. TUNEL and IHC studies are in progress.

Conclusion: Spinach inhibits growth of cervical cancer via downregulation of CDK4 and upregulation of BAX. Therefore, our study suggests a potential use of SE in cervical cancer treatment. Further studies might provide more insight about the effect of SE on other cancers as well.

The gut microbiome and its role in influencing running behavior in male rats ♦ 11 G ♦

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Exercise has well-established physiological benefits, and a lack thereof often gives rise to health conditions. Exercise encompasses a spectrum of activities and varies on an individual level. Prior studies have established connections between our gut microbiome (GMB) and disease pathogenesis and behaviors. We explored the relationship between voluntary wheel running in male rats and GMB composition.

Each rat was randomly assigned into a running (n=8) and sedentary group (n=3). Initially, all rats had no access to a running wheel for one week, after which the running group had full access to the wheel for four weeks. Differences in running distance stratified the running group into high (n=3) and low (n=5) runners. We ran alpha/beta diversities with QIIME2 and analyzed the relationship between bacterial abundance and rungroup/time using generalized least square models.

Ruminococcaceae abundance increased (R2: 0.65, p <0.001), while *Peptostreptococcae* decreased with running distance (R2: -0.47, p: 0.006) in high runners only. *Peptostreptococcaceae* decreased with time (R2: -0.42, p: 0.012) with high runners, while a significant, yet weaker, relationship was observed in low runners (R2: -0.03, p: 0.0421). *Ruminococcaceae f*erments starch into short-chain fatty acids, which helps maintain gut barrier integrity. These findings demonstrate a relationship between GMB composition and behaviors such as running. Further investigation will help us understand what influences exercise variability among individuals.

THC supplementation results in weight loss and sex-dependent gut microbiota changes ♦ 12 G ♦

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Introduction: Obesity and high-fat diets induce consistent alterations in gut microbiota composition, corroborating the relationship between microbiome with host physiology.[1] Observations from epidemiological reviews and experiments also illustrate weight regulation effects of delta(9)-tetrahydrocannabinol (THC) with microbiome shifts.[2,3] We aimed to examine associations connecting gut microbiome changes with THC-induced weight loss.

Methods: High-fat diet induced obese mice were treated with oral THC supplementation while maintaining diet. In addition to measuring weight, fecal samples were obtained at various timepoints, sequenced for bacterial 16s rRNA content and analyzed using QIIME2. Alpha and beta diversity were analyzed along with linear mixed effects (LME) models of bacterial relative abundance relationship to THC treatment and weight change.

Results: In both male and female mice, the THC group had significantly greater average weight loss than controls (-17.8% vs. -0.22%, p=0.00002 and -13.8% vs. +2.9%, p=0.00006 respectively). Male rats had 8 bacterial taxonomic features that were both significantly different in change of relative abundance between THC and controls and correlated with weight change. An LME model of three features explained 76% of the variance in weight change and accurately predicted weight change in a completely different male rat cohort (R=0.64, R^2=0.41, p=0.000001). Female mice had fewer significant predictive features and were difficult to model, but the 3-feature model still accurately predicted weight change (R=0.66, R^2=0.44, p=7e-9).

Conclusions: Our results indicate that gut microbiome composition changes play some role in THC-induced weight loss. Additionally, we proved the concept of a microbiome-based approach to predict weight loss utilizing statistical modeling.

Oncogenes MYC, MAX, and MNT upregulate branched chain amino acid metabolism in peripheral T cell lymphoma ♦ **76 G** ♦

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Peripheral T cell lymphoma (PTCL) is an aggressive non-Hodgkin lymphoma arising in T lymphocytes. Overexpression of the oncogenes *MYC*, *MAX*, and *MNT* is implicated in non-Hodgkin lymphomas where these genes control growth and proliferation by regulating the expression of metabolic genes. The mitochondrial branched-chain aminotransferase (*BCAT2*) and ketoacid dehydrogenase (*BCKDHA*, and *DBT*) genes encode for enzymes that breakdown branched-chain amino acids (BCAAs). BCAAs are a source of energy and metabolites for lymphoma cells. We aimed to investigate whether the expression of *MYC*, *MAX* and *MNT* correlate with that of *BCAT2*, *BCKDHA*, and *DBT* and to understand whether overexpression of *BCAT2, BCKDHA* and *DBT* in PTCL patients correlates with lower cancer survival.
The genomics analysis and visualization platform (R2) was used to access information about the overall survival and gene expression of 193 specimens from newly diagnosed PTCL patients. Kaplan Meier survival curves were downloaded from the platform along with the 2log expression values of each gene of interest. Pearson's correlation coefficient (R) was used to measure the strength and direction of the relationship between the oncogenes and the metabolic genes.

Results indicated a positive and statistically significant correlation between *BCAT2* and *MYC, BCKDHA* and *MYC/MAX*, and *DBT* and *MAX/MNT.* Overexpression of *BCAT2, BCKDHA,* and *DBT* correlated with significantly lower PTCL survival. The findings suggested that the oncogenes upregulate the BCAA metabolic genes in PTCL. While the molecular mechanism of these correlations needs to be addressed experimentally, the findings may serve as a basis for future pharmacotherapy for PTCL patients.

St. John Wort sensitizes bronchial epithelial cells to radiotherapy by upregulation of P21 and BAX ♦ **13 G** ♦

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Background: Lung cancer continues to be one of the most common and fatal cancers. St. John Wort (SJW) is a well-known, yellow-flowering plant found worldwide used medicinally for numerous illnesses. Recently, SJW has been shown to have anti-proliferative and pro-apoptotic effects on lung cancer. However, little is known about the effects of SJW on normal bronchial epithelial cells alone and when exposed to radiotherapy; this study was designed to address this unknown and further explore the potential mechanisms.

Materials and Methods: Clonogenic survival assay, PCNA staining, TUNEL staining, and caspase-3 activity were used to evaluate the proliferation and apoptosis in bronchial epithelial cell line B2B. RT-PCR and IHC were used to investigate the molecular mechanisms.

Results: We found that the percentage of colonies in B2B cells was comparable in the presence and absence of SJW. Interestingly, there was a decrease in the percentage of colonies, optical density, PCNA mRNA, and PCNA staining intensity in B2B cells within the RT/SJW group when compared with the RT group. The relative caspase-3 activity and TUNEL + cells in B2B cells increased significantly in the RT/SJW group when compared with the RT group. Additionally, the RT/SJW group showed a significant increase in the anti-proliferative molecule P21 and pro-apoptotic molecule BAX.

Conclusion: SJW alone has no effect on normal bronchial epithelial tissue. SJW does sensitize bronchial cells to radiotherapy by upregulation of P21 and BAX. This study may be helpful when designing a future protocol combining radiotherapy with SJW for the treatment of lung cancer.

Involvement of APL-1 in Manganese-induced toxicity in *Caenorhabditis elegans* and possible mitigation using Iron Chelators ♦ 14 G ♦

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Manganese (Mn) is an essential element that participates in several biological processes. However, overexposure to Mn may induce neurotoxicity and contribute to the development of neurodegenerative diseases such as Alzheimer's disease (AD). While the pathophysiology of AD is still unclear, aggregation of misfolded β-amyloid (Aβ) plaques in the brain due to changes in amyloid precursor protein (APP) processing has been postulated to contribute to development of AD. Environmental exposure to Mn have been implicated in the etiology of Alzheimer's disease. Here, we used *Caenorhabditis elegans* (*C. elegans*) as a model to explore putative mechanisms of neurodegeneration secondary to exposure to Mn and mitigation using 3 iron chelators: deferoxamine mesylate (DFO), salicylaldehyde isonicotinoyl hydrazone (SIH) and deferoxamine-caffeine (DFCAF). Specifically, APL-1, the *C. elegans* orthologue of mammalian APP, was studied to evaluate its role in neurotoxicity. Studies were carried out in wild-type N2 and APL-1 (yn5) strains to assess sensitivity to reactive oxygen species (ROS) generation, as well as in BY200 worms, where dopaminergic neurons are labeled with green fluorescent protein (GFP) for the evaluation of neurodegeneration. The results showed that the APL-1 strain was more sensitive to Mn than wild-type worms. Moreover, we observed increased levels of ROS upon exposure to Mn (50 mM) in N2 and APL-1 worms compared to controls. Worms exposed to Mn showed increased dopaminergic neurodegeneration, which was rescued iron chelator treatments. Our results show that Mn causes APL-1-dependent increases in ROS levels and neurodegeneration and that treatment with iron chelators can mitigate the Mn-induced effects.

Sex Differences in Obesity- and Aging-Mediated Increase of Body Weight and Blood Pressure. ♦ 15 G ♦

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The rate of obesity is steadily increasing world-wide, and obesity may predispose to chronic kidney disease (CKD) via direct pathway or through its complications such as hypertension. Furthermore, incidence of CKD is affected by aging and obesity accelerates aging especially in association with its complications. Specifically, the relationship between obesity and aging in controlling CKD development has not been well-defined. To address this gap in knowledge, we generated an obese model of 52-58-week-old mice and started the characterization of the model by measuring body weight and blood pressure in male and female mice. We studied four groups of mice: first and second groups were male mice, fed 60% high-fat (HF) diet or 10% low-fat (LH) diet for 19 weeks. Third and fourth groups were female mice, fed HF or LF diet for the same number of weeks. A gain in body weight was measured in male mice on HF when compared to LF diet and was associated with a significant diet-dependent increase (about 30%) of blood pressure. The body weight gain in female mice was more pronounced than in male mice (62% female *vs.* 54% male). Blood pressure was higher in female mice than in age-matched male mice in control conditions and was not diet dependent. These findings suggest sex differences in the increase of body weight and blood pressure mediated by diet-induced obesity in mice of 52-58 weeks of age. These findings are valuable to aid the understanding of the relationship of determinants that control progression of kidney diseases.

Changes In Metabotropic Glutamate Receptor Trafficking During Protracted Ethanol Withdrawal ♦ 16 G ♦

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As a result of chronic ethanol exposure, the brain undergoes neuroadaptive changes as a response to glutamatergic dysregulation. In this study, quantified the expression of group I metabotropic glutamate receptors (mGlu1 and mGlu5), during withdrawal from chronic intermittent ethanol exposure. In addition, we also quantified known trafficking/anchoring partners, including Homer proteins. This quantification was conducted using western blot analysis on whole tissue lysate as well as after a biotin labeling of surface (membrane bound) proteins in withdrawal and control rats. Our exposure paradigm consists of rats being exposed to volatilized ethanol vapor pumped into a sealed chamber for four consecutive days, followed by a three-day withdrawal. This cycle continued for three weeks after which the rats are placed into forced withdrawal withdraw for 35 or 55 days. Tissue from the basolateral amygdala (BLA) was then micro dissected for further processing and western blot analysis. Our results showed no significant changes in metabotropic glutamate receptor trafficking. However, we did notice Homer 1b/c significantly decreased in surface protein expression while Homer 2 was significantly increased in levels of surface protein expression. These data suggest differential trafficking of Homer and mGlu proteins that could differentially impact synaptic function during protracted withdrawal. Future studies will seek to measure the functional contribution of mGlu during protracted withdrawal.

Estrogen influences voluntary wheel running behavior in female rats ♦ 17 G ♦

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Regular exercise is recognized for its mental and physical health benefits in contrast to the complex risks associated with a sedentary lifestyle. Although the physiological mechanisms underlying the positive effects of exercise are well-established, the factors influencing exercise behavior and the motivation to maintain regular

physical activity remain largely unknown. Using a rodent model of voluntary wheel running (VWR), we investigated the role of estrogen in exercise behavior and its regulation. We found that female rats ran more than their male counterparts, and they displayed a unique rhythm in daily activity which directly mirrored the fluctuating estrogen levels throughout the estrous cycle. This rhythm was evident in the daily running distance, speed and running duration under normal physiological conditions. Ovariectomy (OVX) significantly reduced overall VWR activity and eliminated the rhythm. Subcutaneous injections of estradiol benzoate (EB) at 1.5 µg in an OVX background reliably revived overall VWR activity to similar levels before OVX. This estrogen replacement preserved individual differences, such that high vs. low runners before OVX remain high and low runners after treatment, indicating a causal link between estrogen and VWR activity. However, this EB-induced behavioral response took more than 24 hours to manifest, suggesting a temporal arrangement and activation of estrogen/estrogen receptor-mediated genomic signaling cascades with VWR responses. Investigating the molecular events prior to the behavioral manifestation provides a unique opportunity for identifying estrogen-dependent molecular mechanisms that drive running behavior. Understanding these mechanisms is critical for improved strategies to promote physical activity in humans.

Exploring variability in stress-induced persistent physical activity: an examination of individual and sex differences ♦ 18 G ♦

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A sedentary way of life significantly contributes to chronic and metabolic illnesses, carrying substantial economic implications for healthcare systems worldwide. Although psychological stress exposure is recognized as a risk factor for sedentary lifestyles, there is limited knowledge regarding how stress influences physiology in ways that render individuals more susceptible to chronic inactivity, even long after the stressor has ended. To bridge this knowledge gap, we utilized a rodent model involving voluntary wheel running (VWR) to examine the effects of acute stress on physical activity. In our study, young adult rats subjected to 100 tail-shocks exhibited a prolonged reduction in daily VWR distance for weeks following the stressor, persisting beyond the period of anxiety and depression-like behaviors. Notably, there was a wide range of variation in wheel running distance due to individual differences in stress responses. Additionally, intriguing sex differences were observed, with female rats showing no or a milder detrimental effect on VWR following the same stressor. Depending on the types of running wheels, the stress even led to an enhancement of VWR activity, particularly among low-running females, suggesting a potential protective role of estrogen against stress-induced physical inactivity. To further delve into these findings, we are currently investigating estrogen and estrogen receptor-dependent molecular processes in brain regions linked to exercise motivation and execution. Understanding the physiological mechanisms underlying individual and sex differences is essential not only for comprehending the lasting impacts of acute stress on physical activity but also for identifying innovative interventions to combat sedentary lifestyles.

Polycystic Ovarian Syndrome and Obstructive Sleep Apnea: A Dynamic Duo for Cardiorenal Risk? ♦ 19 G ♦

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Polycystic ovarian syndrome (PCOS) is an endocrine disorder that impacts women of reproductive age, with an estimated prevalence as high as 20%. PCOS is associated with obesity, hypertension, and in some studies chronic kidney disease (CKD). The pathophysiological nature of these relationships is complex and incompletely understood, but studies show a high prevalence of co-morbid Obstructive Sleep Apnea (OSA) in women with PCOS. Given that OSA is independently associated with the development of hypertension, glomerular dysfunction, and proteinuria we hypothesize that OSA in women with PCOS contributes to or exacerbates the development of renal damage, hypertension, and progression of CKD. A review of the literature was performed using the National Library of Medicine. Articles published between January 1998 and July 2023 were selected for review. Randomized controlled trials, reviews, and systematic reviews were all included. Search terms include 'polycystic ovarian syndrome', 'obstructive sleep apnea', 'chronic kidney disease', 'cardiovascular risk', and 'hypertension. We found that women with PCOS and OSA have higher blood pressure and an increased risk of negative cardiovascular outcomes. In patients with PCOS high levels of urinary albumin excretion were noted as well as increased intraglomerular pressure, and microalbuminuria. OSA was also found to be associated with poor renal function, albuminuria, and decreased glomerular filtration rate. Potential pathophysiological links are discussed in greater detail in the poster presentation. More research is needed to determine if co-morbid PCOS and OSA results in greater risk for hypertension and CKD and should address underlying pathophysiological mechanisms.

Fennel constrains growth of pancreatic cancer by inhibition of proliferation and promotion of apoptosis ♦ 20 G ♦

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Background: Pancreatic cancer is one of the deadliest cancers. Despite current gold-standard treatment regimens, outcomes are overwhelmingly poor. Novel therapies are necessary to improve treatment of pancreatic cancer. Previous studies show that phytochemicals in fennel decrease the incidence of colon cancer and the multiplicity of breast cancer. However, no studies have explored the effect of fennel on pancreatic cancer.
This study investigates the effect of fennel on growth of pancreatic cancer and its possible molecular mechanisms.

Methods: Clonogenic survival assay, cell proliferation, TUNEL staining, and caspase-3 activity kits were used to evaluate the direct effects of fennel seed extract (FE) on cell survival, proliferation, and apoptosis of the widely-studied pancreatic cancer cell line Pan-48. We further investigated possible mechanisms using RT-PCR and IHC.

Results: The percentage of colonies of Pan-48 pancreatic cancer cells decreased significantly after FE treatment. This paralleled a decrease in the OD value of cancer cells treated with FE. Furthermore, the relative caspase-3 activity increased significantly in the presence of FE. The anti-proliferative effect of FE on Pan-48 pancreatic cancer cells correlated with increased expression of p16 and p53. Likewise, the pro-apoptotic effect of FE correlated with increased expression of Fas, TRAIL, TRAILR1 and decreased expression of Bcl-2. Studies about TUNEL and IHC are in progress.

Conclusions: Fennel constrains growth of pancreatic cancer by inhibition of proliferation and promotion of apoptosis. Further investigation may provide insight into the mechanisms of these changes, along with the potential for fennel as a powerful natural agent in treating pancreatic cancer.

Chronic Intermittent Hypoxia Conditioning Augments Decrements in Renal Microcirculatory Perfusion During Asphyxia ♦ 21 G ♦

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Sleep apnea (SA) is highly prevalent in patients with chronic kidney disease and may contribute to the development and/or progression of this condition. Previous studies suggest that dysregulation of renal hemodynamics and oxygen flux may play a key role in this process. The present study sought to determine how chronic intermittent hypoxia (CIH) associated with SA affects regulation of renal microcirculatory perfusion (RP) and cortical and medullary tissue PO2 as well as expression of genes that could contribute to renal injury. We hypothesized that normoxic tissue PO2 would be reduced after CIH relative to baseline, and that RP and tissue PO2 would be decreased to a greater extent in CIH vs sham during exposure to intermittent asphyxia (IA, FiO2 0.10/FiCO2 0.03). Additionally, we hypothesized that gene programs promoting oxidative stress and fibrosis would be activated by CIH in renal tissue. All physiological variables were measured at baseline (FiO2 0.21) and during exposure to 10 episodes of IA (excluding GFR). Normoxic renal tissue PO2 was significantly lower in CIH vs sham ($p < 0.05$). Reductions in RP and renal tissue PO2 during IA occurred in both groups but to a greater extent in CIH ($p < 0.05$). Pro-oxidative and pro-fibrotic gene programs were activated in renal tissue from CIH but not sham. In conclusion, CIH adversely affects renal microcirculatory perfusion and oxygen flux during both normoxia and IA and results in changes in renal tissue gene expression. Supported by R15 HL138600-01 and MSRP.

Aloe vera: Could the popular soothing plant have a role in the treatment of colon cancer? ♦ 22 G ♦

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Background: Colon cancer is the most common digestive cancer in the US. Aloe vera has long been used topically to soothe skin burns. In recent years, it has been shown to have anti-tumor effects. However, little is known about its effect on growth of colon cancer. This study was designed to investigate the effect of aloe vera on the survival, proliferation, and apoptosis of colon cancer in an attempt to evaluate the potential of aloe vera as an anti-tumor agent.
Methods: HCT 1116, a commonly used colon cancer cell line, was used and cells were exposed to aloe vera extract (AE). The effects of AE on the survival, proliferation, and apoptosis of the cells were studied using

clonogenic survival assays, cell proliferation kit, and caspase-3 activity kits. RT-PCR and IHC were used to further investigate molecular mechanisms.

Results: Colon cancer cell colony count was significantly lower in the presence of AE. This was further supported by a decrease in the optical density value of colon cancer cells in the presence of AE. The relative caspase-3 activity was higher in the presence of AE in colon cancer cells. The anti-proliferative effect of AE on colon cancer cells correlated with lower expression of cyclin B. The pro-apoptotic effect of AE on colon cancer cells correlated with lower expression of survivin.

Conclusions: Aloe vera inhibits growth of colon cancer by downregulation of cyclin B and survivin. Such a study suggests aloe vera may have a role in treatment of colon cancer and warrants further studies.

Wild Jujube suppresses growth of bronchial epithelial cells and upregulates PDL1 and OX40L ♦ **23 G** ♦

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Background: Lung cancer is the leading death-causing cancer in the US. Wild Jujube (WJ) is a popular fruit in Asia and has been shown to have anti-cancer properties including lung cancer. However, little is known about its effects on normal bronchial epithelial cells. Co-stimulatory molecules such as PDL1, PDL2, 4-1BBL, OX40L, and CD74 are a group of cell-surface molecules activating or inhibiting T cells. These molecules play a critical role in T-cell activation against cancer. However, the role of WJ on the expression of the co-stimulatory molecules is unknown yet. This study will investigate the effects of WJ on growth in bronchial epithelial cells and on the expression of key co-stimulatory molecules.

Methods: Normal bronchial epithelial cell line, B2B, was treated with WJ extract (WJE). Clonogenic Survival Assay and Cell Proliferation kit were utilized to measure the growth of B2B in the presence of WJE. RT-PCR and IHC were utilized to determine the effects of WJE extract on expression of key co-stimulatory molecules PDL1, PDL2, 4-1BBL, OX40L, and CD74.

Results: The percentage of colonies of B2B cells was significantly lower in the presence of WJE. In line with this, a decrease in the OD value of B2B cells in the presence of WJE was also found. PDL1, PDL2, 4-1BBL, OX40L and CD74 were constitutively expressed in B2B cells. The mRNA expression levels of PDL2, 4-1BBL, and CD74 were comparable in the presence of WJE to those in the absence of WJE. However, the mRNA expression levels of PDL1 and OX40L were much higher in the presence of WJE. IHC for PDL1 and OX40L is in progress.

Conclusion: WJ suppresses the growth of bronchial epithelial cells and upregulates the expression of PDL1 and OX40L. The clinical significance of the upregulation of OX40L is unclear. However, the upregulation of PDL1 by WJ may protect normal bronchial epithelial cells from immune attack while lung cancer cells are targeted by immunity. Such a study may provide useful information to design WJ as an option for the treatment of lung cancer.

Targeting branched-chain amino acid metabolism for the treatment of chronic myeloid leukemia ♦ 24 G ♦

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Chronic myeloid leukemia (CML) is caused by a chimeric fusion of human chromosomes 9 and 22. This produces a hybrid BCR-ABL tyrosine kinase that drives abnormal myeloid cell proliferation. BCR-ABL positive CML is treated with tyrosine kinase inhibitors (TKIs). Mutations in the BCR-ABL gene chimera reduce the efficacy of TKIs. Our study aimed to target genes influencing CML metabolism as a new approach to overcome CML resistance to TKIs. We focused on the branched-chain amino acid (BCAA) metabolism since it stimulates CML growth. By using the eukaryotic promoter database (EPD) we found that the transcription factor JUN-B has putative binding sites in the promoter regions of 4 genes in BCAA metabolism, *BCAT1*, *BCAT2*, *BCKDHA* and *DBT*. JUN-B induces apoptosis, but it is silenced in CML. CML specimens, collected before (baseline, n=135) or after treatment with 400mg (n=30) and 800mg (n=33) Imatinib (TKI), were obtained from the R2-genomic analysis platform. T-test analysis tested the difference between the gene expression of JUN-B and the BCAA metabolic genes. In baseline specimens, there was a significant negative correlation between the expression of JUN-B and *BCAT1/BCAT2* suggesting that JUN-B is their negative regulator in CML. Treatment with Imatinib reduced the expression of *BCAT1* but not that of *BCAT2, BCKDHA or DBT*. Results suggest that *BCAT1* and *BCAT2* are downstream targets of JUN-B and Imatinib may reduce the burden of CML by downregulating the expression of *BCAT1*. These findings provided the background to investigate the mechanism of targeting BCAA metabolism in CML in TKI resistant patients.

Chronic kidney disease is accompanied by behavioral deficits in rodents ♦ 25 F♦

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Clinical reports indicate a bidirectional relationship between mental illness and chronic systemic disease. Kidney injury and inflammation have been linked to brain dysfunction and alterations in learning and memory, as well as development of anxiety and depression, however, the underlying neurophysiological mechanisms remain elusive. In the current study, we investigated whether a chronic kidney disease (CKD) state is sufficient to produce deficits in rodent stress behaviors using a mild or severe model of CKD. Male rats were exposed to either 21 days of 0.75% adenine diet (AD) (model of mild CKD), or a combination of AD with unilateral nephrectomy (AD/Unx), prior to the start of AD (model of severe CKD). Control rats received sham surgery and remained on normal diet/chow throughout the experimental paradigm. CKD development in the rat models was determined by an increase in serum creatinine used as index for kidney function. Behavioral testing results demonstrate that mild CKD, especially in combination with unilateral nephrectomy (severe CKD), is accompanied by anhedonia (i.e., decreased sucrose preference) and anxiogenic effects evident from increased latency to feed in the novelty-suppressed feeding test. These findings suggest that impairment of kidney functionally is adequate to evoke behavioral deficits in rodents consistent with elevated behavioral emotionality (i.e., development of depression- and anxiety-related behaviors). Ongoing studies are focused on identifying neurophysiological mechanisms linking renal disease with neurological abnormalities. Furthering our understanding of these mechanisms may aid in the development of improved treatments and prevention strategies for management of mental health comorbidities associated with kidney disease.

Use of hormonal contraception and risk of ACL injury in women ♦ 26 G ♦

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Women are at greater risk for anterior cruciate ligament (ACL) injury than men. Several studies have suggested that hormonal fluctuations contribute significantly to this difference. We will summarize the literature to describe the effect of using hormonal contraceptives on the stability of the ACL joint in women. By providing a concise synthesis of available research, readers will be able to discern whether using hormonal birth control is a good option for females if they are concerned about risk of injuring their ACL. Review of articles including only reviews and randomized controlled trials published after 2017. Collectively, these data suggest that the use of hormonal contraceptives does provide a protective effect on the ACL for women, but further investigation is still warranted.

A loss of branched-chain aminotransferase (BCAT) enzyme function enhances T regulatory cell lineage commitment 🌟

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Amino acid availability strengthens T cell-driven immunity. The branched-chain amino acids (BCAAs) are essential for T cell activation. The cytosolic and mitochondrial branched-chain aminotransferases (BCATc and BCATm), which catabolize BCAAs, are implicated as T cell immunosuppressive enzymes. While BCAT enzymes are well characterized in tumor growth, their impact on $CD4^+$ T cell lineage commitment remains unknown. The objective of this study was to decipher the role of BCATc and BCATm in the differentiation of $CD4^+$ T cells into regulatory T cells (Tregs), which are known to maintain peripheral immunotolerance. $CD4^+$ T cells were isolated from the spleens of wild type (WT) mice or mice with T cells deficient in BCATc (T-BCATc^{KO}) or BCATm (T-BCATm^{KO}) followed by activation with anti-CD3/CD28 in the absence (undiffered control) or the presence of transforming growth factor (TGFβ), cytokine-IL2, anti-IFNy and anti-IL4 for 4 days to induce Treg lineage commitment. RT-PCR was performed to analyze expression levels of the Treg lineage specific transcription factors: forkhead box protein 3 (FOXp3) and TGFβ. WT $CD4^+$ T cells, induced to Tregs, significantly downregulated BCATc and BCATm. Further, a loss of expression of BCATc or BCATm significantly increased Foxp3 and TGFβ expression in Tregs compared to undiffered controls. Pharmacological treatment with n-acetyl leucine amide (NALA), an antagonist of the BCAA, leucine, reversed the effect of a loss of function of BCAT. Taken together, these results indicate a loss of BCAT enzymes enhances Treg differentiation and point toward a role of BCAA metabolism in the regulation of immunotolerance.

CLINICAL

Protocol for Retrospective Analysis of Baseline Concussion Testing Records ♦ 59 G ♦

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Background: There are a variety of tests available to determine the severity of sports-related concussion (SRC). As athletes perform numerous cognitive assessments, there is a high likelihood that mental fatigue becomes a factor that impacts neurocognitive performance. Because of the importance of high performance on baseline assessments, it is vital that mental fatigue is not detrimental. By optimizing baseline testing to reduce mental fatigue, there can be greater certainty that when athletes return to sport following an SRC, they are safe.

Methods: With IRB approval, participant records from athletic training services will be reviewed for data utilization consent for research purposes by a certified athletic trainer. Potential participants include adult, female athletes involved in contact sports (tackle football). Records will be de-identified using a numeric identifier for each participant and data will be extracted using a standardized collection form in Excel. The data recorded will include self-reported information related to age, gender, weight, height, medications, past medical/surgical history, and medical diagnoses related to concussion recovery. Data capture will include the physical performance results and test sequencing from baseline testing, including the modified COBALT, VOMS, BlazePod tests, DropStick tests, grip strength, King Devick, Post Concussion Symptom Scale, and SCAT-5.

Future Work: Data will be analyzed descriptively, noting frequencies for reported demographic and health history items and average for age, weight, height, and performance data. Relationships between data and testing sequence will be examined to promote optimal order for baseline testing, as well as test-retest reliability and convergent validity will be determined.

Formation of asymptomatic intraabdominal and intrafascial heterotopic ossificans following repeated abdominal surgeries: Case report ♦ 60 G ♦

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Background: This case study discusses a rare case of abdominal heterotopic ossification (HO).

Clinical case: Middle-aged man presented for an elective colostomy reversal. He had an extensive surgical history including open sigmoid resection for recurrent diverticulitis with primary umbilical hernia repair, and subsequent resection of anastomosis, additional washouts, and eventually an ostomy formation for a perforated anastomotic site. Now, he felt well and desired a colostomy reversal. Incidentally during the colostomy reversal, at least 30 separate pieces of heterotopic bone formation were encountered within the interloop spaces and removed from the patient's abdomen, some of which were excess of 10cm x 10cm in size. Seven months after the reversal, only a single area of ossification was present towards the upper aspect of the fascia.

Clinical lesson: HO can present as early as two weeks post abdominal surgery and may lead to obstructive symptoms. There have been cases of more serious consequences like jejunal perforation post fall in patient with HO. Our patient was asymptomatic. The etiology of HO is multifactorial and surgery remains as the primary treatment option with evidence for benefit with early intervention, but some authors recommend delayed intervention to reduce HO recurrence. Although other treatment options are available in the orthopedic

world, prophylactic NSAIDs, radiation therapy, and bisphosphonates are not recommended for abdominal heterotopic ossification. Open abdomen can be a possible risk factor for the development of heterotopic ossification which has been reported by another similar case of HO.

Symptom recovery time under the ocular domain for concussion: a systematic review ♦ 61 G ♦

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Background- The objective of this literature review was to investigate normative timeframes of symptom resolution under the ocular domain of concussion.

Methods- An electronic search was conducted in 3 databases (Scopus, Google Scholar, and PubMed). Search results were restricted to the last 6 years and utilized a combined list of terms related to concussion and ocular domain symptoms. A hand search was performed for relevant citations on all included articles. A total of 7 studies met the inclusion criteria and reported outcome measures. Included in these 7 studies were 987 number of participants. All searches were conducted between May 30, 2023 and July 13, 2023.

Results- Results of each study were reported in mean and/or median recovery times. A range of medians was reported in the data, as well as a range of means. Overall, the results showed a median recovery time of ocular concussion symptoms at finding a range of 8 to 150 days depending on the symptom and the study. A range of means was reported as well, finding a range of means from 9.4-40.8 days, with an average of the means calculated to 21.1 days.

Conclusion- Symptoms within the ocular domain typically resolved within 40 days. Additionally, a pattern was observed in recovery times when looking at age and the days to therapeutic intervention. Patients under the age of 18 had longer recovery times compared to their over 18 counterparts. Patients who had therapeutic interventions started <30 post-injury recovered faster than those who did not.

A rare presentation of Charcot neuroarthropathy: ipsilateral recurrence in the presence of end-stage renal disease ♦ 62 G ♦

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Charcot neuroarthropathy (CN) is a rare, catastrophic joint complication that is most often seen in patients with peripheral neuropathy secondary to diabetes mellitus (DM). It is generally accepted that CN rarely recurs in the ipsilateral limb, and very few cases of multiple CN events occurring on the same limb have been reported in literature. This case study aims to illustrate a rare presentation and progression of a patient with CN currently undergoing offloading treatment. Due to the patient's presentation of extreme pain, an HbA1c within goal limits, and history of uricemia secondary to renal dysfunction, we believe our patient's CN is secondary to impaired uric acid clearance in the setting of end-stage renal disease (ESRD). To our knowledge, this case is the only description of an ipsilateral CN incident secondary to uremic neuropathy. In addition, it appears that this is the only reported incidence of tertiary ipsilateral CN. A literature search indicates that about 30% of patients with

CN also present with ESRD. Therefore, early consultation with podiatric care is essential in renally-impaired patient populations to prevent amputations and morbidity associated with foot complications, such as CN.

Temporary bilateral central scotoma under scotopic conditions associated with oral Semaglutide ♦ 63 G ♦

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Introduction: To report a case of a bilateral central scotoma present under scotopic conditions with a positive afterimage associated with the short-term use of Semaglutide in a male ophthalmologist that resolved with medication discontinuation.

Case Presentation: A 72-year-old male ophthalmologist, with an ocular history of macular drusen and cataract surgery in the right eye, noticed a constant, unchanging scotoma in his right eye and subsequently his left eye 20 days after starting 3.0mg Semaglutide once daily. The right eye scotoma was only present in a dimly lit room and would persist until he was in a photopic condition. Upon closing the eyes, the scotoma would be followed by a bright white positive afterimage that would fade within 6 seconds. After a few days, the scotoma of the right eye changed shape, and the day after he experienced a scotoma of his left eye. Medication was stopped after the left eye developed symptoms. After discontinuation, the scotomas subsided within 3 days. An ocular exam with macular and retinal nerve fiber layer OCT and HVF 10-2 testing revealed no remarkable findings except for scattered drusen on OCT with no diabetic retinopathy. Either any findings resolved prior to evaluation, or the pathophysiologic process could not be identified with testing.

Discussion: Semaglutide is approved for weight loss and diabetic treatment; however, there is more to learn about its potential visual side effects. One potential association is the development of a central, bilateral scotoma present under scotopic conditions that can resolve after medication discontinuation.

Incidence of floating toe with Weil osteotomy: A systematic review ♦ 64 G ♦

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Purpose: This systematic review and meta-analysis aimed to reevaluate the current incidence of the floating toe complication following Weil osteotomy and possible reasons for a change.

Introduction: Floating toe subsequent to a Weil osteotomy is a well-known complication[11]. Current Weil osteotomy floating toe incidence is unknown as is the associated complication rate variability with adjunctive procedures. The purpose of this study aims to reevaluate the current incidence of floating toe complications following a Weil osteotomy, compared to the previously reported rate of 36% by Highlander et al in 2011.

Methodology: Following PRISMA guidelines, a systematic review was conducted from 2012 on using PubMed, SCOPUS, and Cochrane Library utilizing specific keywords. Inclusion criteria encompassed

individuals aged 18 or older, excluding certain conditions and prior surgeries. This yielded 2258 articles, refined to 782 unique ones for meticulous analysis. Thirteen pertinent articles were selected for in-depth examination, with nine preceding to full analysis including Weil osteotomy floating toe incidence, adjunctive procedures, weight-bearing status.

Results: Demographics, complication frequencies, and Weil osteotomy data were analyzed from 1018 cases. Most studies were clinical evidence level 3 (n=4), followed by level 2 (n=3), and our lowest being level 4 (n=2). A total of 741 osteotomies were included with predominantly female participants and an average age of 58.8. Floating toe incidence post-osteotomy was 20%.

Conclusion: A significant decrease in floating toe incidence post-Weil osteotomies was observed compared to the benchmark study in 2011.

Blood pressure cuff size accessibility for larger-bodied patients in physical therapy settings 🌟

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Arm sizes vary among Americans with 43% requiring large size blood pressure cuffs. Negative patient perception occurs when equipment does not accommodate their body size. Additionally, improperly sized blood pressure cuffs result in invalid measures. The aim of this study was to investigate the availability of blood pressure cuffs to accommodate larger-bodied patients in physical therapy settings. A secondary aim was to compare availability between outpatient and inpatient settings.

This was part of a larger descriptive study. An electronic survey was distributed to 406 Clinical Affiliates of Des Moines University's Physical Therapy Program to assess blood pressure cuff availability in various sizes (standard, large, thigh). Frequencies were calculated and reported in valid percent for each setting. Chi square analyses were performed comparing frequencies between outpatient and inpatient settings.

Ninety-five responses were received, 75 outpatient, 20 inpatient. Reported frequencies of available standard-size blood pressure cuff were 98.6% and 100% for outpatient and inpatient settings respectively. Frequencies of available large-size blood pressure cuffs were 83.8% and 100% for outpatient and inpatient physical therapy settings respectively. Reported available thigh-size blood pressure cuff were 14.1% and 31.6% for outpatient and inpatient physical therapy settings respectively. No significant difference was found between settings.

Outpatient settings did not consistently report availability of standard or large cuffs. Neither setting consistently reported availability of thigh cuffs. Appropriately sized blood pressure cuffs are required for valid measurement. Inappropriately sized equipment may compromise patient outcomes and elicit negative patient perceptions. Clinicians should advocate for all cuff sizes to be available.

Functional outcomes after reverse shoulder arthroplasty. A systematic review comparing anterosuperior and deltopectoral surgical approaches. ♦ 65 G ♦

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Reverse shoulder arthroplasty (RSA) was approved by the FDA in 2003 as an alternative surgical intervention to anatomical shoulder arthroplasty (TSA). Expansion in indications for this surgical procedure and increasing

surgical expertise has likely contributed to the dramatic increase in its utilization over the past two decades. The most common surgical approaches for RSA are deltopectoral (DP) and anterosuperior (AS). The active and passive anatomical structures affected by these two surgical approaches differ drastically, which prompted us to systematically review the literature comparing their functional outcomes.

Electronic databases were searched (PubMed and Cochrane Library) according to PRISMA guidelines for studies directly comparing functional outcomes of the AS and DP approaches for RSA. Multiple functional outcomes were included according to their validity and reliability (Constant Score, OSS, DASH, ASES or WOSI). After screening, published articles that met the inclusion criteria were reviewed.

A total of 165 studies were obtained during our initial search, and 33 were selected for full-text review. Ultimately, 5 studies were included, consisting of three retrospective reviews, one prospective cross-sectional cohort, and one prospective randomized trial. The methodological quality of the included studies was assessed using the Methodological Index for Nonrandomized Studies (MINORS). Synthesized data from these studies will be presented.

Besides surgeon training/preference, DP and AS approaches both have advantages and drawbacks. Illustrating the comparison of functional outcomes between these two surgical approaches for RSA with relevant clinical information may assist surgeons in choosing the most appropriate technique for improved patient specific outcomes.

Bimalleolar equivalent ankle fracture joint contact: Comparison of two stabilization methods. ♦ 67 F ♦

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Introduction: When surgically repairing an ankle fracture one goal is to restore the stability of the ankle joint. The osseous injury that occurs during an ankle fracture can be accompanied by a ligamentous injury, specifically to the deltoid ligament complex. The purpose of this study is to evaluate measuring the contact area of the ankle joint with different stabilization methods of the deltoid ligament.

Methods: 5 frozen cadavers were utilized for this study. Ultra-low contact film was cut to match each of the unique anatomic characteristics of the talus. The film was carefully placed and secured within the ankle joint. An axial load of 100 psi was applied to each ankle under 4 conditions: (1) Normal ankle, (2) transected deltoid ligament off the medial malleolus, (3) transected deltoid ligament off the medial malleolus with a syndesmotic screw through a plate, and (4) direct repair of the deltoid ligament. The ankle joint contact area was tested in the 4 conditions and analyzed using the FujiFilm Pressure Mapping System ©.

Results: Our study demonstrated that the primary repair of the deltoid ligament more closely represented the average contact pressure of the normal ankle compared to syndesmotic screw placement. The highest maximum pressure was comparable to the normal ankle in the syndesmotic screw placement but the total areas of highest pressure and total area measured were elevated with the syndesmotic screw specimens compared to the normal ankle.

Second screw optimal compression of the posterior facet with subtalar joint arthrodesis: A comparison of two different screw placements ♦ 66 F ♦

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Introduction: Subtalar joint (STJ) arthrodesis has historically been a common method of treating a variety of foot and ankle pathologies. Previous research describes varying surgical methods, as well conflicting evidence on success rates for STJ arthrodesis. One of the potential limitations of STJ arthrodesis is the small joint size for the arthrodesis and the unique joint anatomy. The purpose of this study is to provide a consensus on the optimal screw placement for the second screw that is extra-articular that will allow optimal compression across the posterior facet.

Methods: 5 frozen cadavers were utilized for this study. Ultra-low contact film was carefully placed and secured within only the posterior facet of the joint. Two screw positions were utilized: (1) Posterior-inferior aspect of the calcaneus to the talar neck and (2) plantar aspect of the calcaneus to the dorsal talus just anterior to the posterior facet. 6.5mm compression screws were used separately for each location. The film was then analyzed using a Fujifilm Pressure Mapping System© while varying the location of the second screw.

Results: In all 5 cadavers, the plantar-inferior to the talar neck screw provided more compression across the posterior facet of the subtalar joint compared to the plantar to dorsal screw.

Conclusion: This cadaveric study shows that the compression pressure and area of the posterior facet greater when the second screw runs from posterior-inferior calcaneus to the dorsal distal talar neck compared to the plantar to dorsal screw configuration.

Systemic reaction to calcium phosphate after retrograde repair of a osteochodral lesion of the talus   ♦ 68 G ♦

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Introduction: Osteochondral lesions of the talus (OLTs) is a common pathology involving hyaline cartilage and/or underlying bone. Surgical decision making of OLT repair is reliant on the location of the OLT and quality of the cartilage and the bone. Retrograde drilling of the subchondral bone is a common modality for repair of OLTs. This is a case report of a systemic reaction to the graft material during the immediate post-operative after a retrograde drilling.

Case Report: A 34 year old female presented with chronic pain in the left ankle. Imaging revealed a posterior-medial OLT. The patient agreed to and underwent an ankle arthroscopy with extensive debridement and a retrograde drilling of the OLT with with the use of 1.6cc of calcium phosphate to 'backfill" the retrograde drilling. Approximately 24-36 hours after the surgery, the patient presented to the emergency room with a fever of 101.6, chills, tachycardia and severe left ankle/lower leg pain. Exam of the left lower extremity showed no signs of any infective process.   X-rays of the left ankle showed a large amount of osseous appearing debris along the soft tissue plane of the ankle.   The patient was diagnosed with a "fever of unknown origin" (FUO). Serial radiographs during the post-operative period has shown significant gradual decrease in the appearance osseous material at the 4 week, 8 week, and 12 weeks. The patient has not reported any additional fevers. She does report pain along the intermediate dorsal cutaneous nerve where some of the graft material continues to absorb.

Opioid use and naloxone prescribing upon discharge in a metropolitan health system ♦ 69 G ♦

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Background: In 2021, 258 Iowans died of opioid overdose, a 21% increase from 2020. Naloxone is a life-saving medication for opioid overdoses. The purpose of this study was to determine current prescribing trends of naloxone for patients discharged on opioids after an inpatient admission.

Methods: This is a retrospective, chart-review study of adult, non-chronic opioid users admitted to the health system in January 2022 who were prescribed an opioid upon discharge. The primary endpoint was to identify naloxone prescribing opportunities for adult patients discharged on opioids after hospital admission. The MercyOne IRB approved the study; informed consent was not required.

Results; Overall, 1,547 adult patients were discharged in January 2022, while 288 patients (18.6%) received opioids at discharge. There were no prescriptions of naloxone provided during the time frame within the included population. The median total morphine milligram equivalent (MME) prescribed was 145 (IQR 75-210) while the median daily MME was 45 (IQR 30-45). Thirty-three patients (11.5%) received more than 50 MME per day at discharge and 23 patients (7.9%) received more than 90 MME per day. Common opioids included oxycodone (208 (72.2%)), hydrocodone products (44 (15.3%)), tramadol (34 (11.8%)), and codeine products (2 (0.7%)). Opioids were more commonly prescribed by surgical than medicine teams, 213 vs. 75 respectively.

Conclusion: Of the 288 patients discharged on opioids from the health system, no naloxone prescriptions were provided. Naloxone prescribing has been linked with stigma of the recipient; however, there are opportunities for increased prescribing within the health system.

Reliability of a New Foot Arch Muscle Performance Test ♦ 70 G ♦

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Background: Weakness of the foot's arch is associated with pain, gait abnormalities, and balance deficits. Therefore, measurement of arch strength is relevant in the management of these conditions, but currently there is no method to quantify muscle performance of the foot arch.

Purpose: To assess the reliability and measurement error of a novel foot arch muscle performance test.

Methods: 11 healthy subjects were recruited and trained to perform the test which involved raising the foot's arch while maintaining contact of the rear- and forefoot. Testing was completed on two separate days by a single investigator blinded to the results. A handheld dynamometer was fixated on the top of the foot's arch near the navicular bone. Subjects pushed their arch into the device which measured peak force production. An average of the three highest trials from each session was used to calculate the interclass correlation coefficient (ICC), standard error of measurement (SEM), and the minimal detectable difference (MDD).

Results: The mean peak force of the sample was 17.2 lbs (SD 10.3). Test-retest reliability was high, ICC = 0.881 (95% CI 0.585-0.967). SEM was 3.56 lbs and the MDD was 9.87 lbs.

Discussion: Clinicians can feel confident using this testing procedure to quantify intrinsic and extrinsic foot arch muscle performance. Until further analysis with a larger sample, differences less than 4 lbs may be attributed to error of the measure and when tracking outcomes differences less than 10 lbs may not be meaningful.

Allograft reconstruction of a chronic tibialis anterior rupture ♦ 71 G ♦

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Introduction: The tibialis anterior (TA) plays an important role in dorsiflexing and inverting the foot. Although relatively rare, the tibialis anterior is the third most commonly ruptured tendon of the lower extremity. Most common mechanisms of injury include direct trauma, indirect trauma, an applied dorsiflexory force, and spontaneous rupture. This case study highlights the secondary tendon repair of a chronic tibialis anterior tendon rupture utilizing a peroneus longus allograft.

Case Report: Patient is a 74 year old male with diabetic neuropathy and peripheral vascular disease (PVD). Mechanism of injury was a slip off a curb to the left lower extremity 10 months prior to surgery. Six weeks after the injury he noticed a decrease in strength on the affected side. Physical examination revealed a defect along the left tibialis anterior tendon and lack of dorsiflexion strength especially with isolation of the TA. Surgical reconstruction was performed using a peroneal tendon allograft.

Discussion: Acute ruptures of the TA usually involve young individuals with a high activity level, whereas chronic ruptures usually occur in older patients with a history of diabetes, gait abnormalities, and poor coordination. Unfortunately, the delay in diagnosis may result in a widening gap of the tendon preventing a direct tendon repair. Surgical treatment has been found to restore function even with delay of diagnosis, making it preferred for physically active patients who are surgical candidates.

Biallelic Optic Atrophy (*OPA1*) Related Disorder – Case Report and Literature Review 🌟

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Introduction: The most common hereditary optic neuropathy, dominant optic atrophy (DOA), is inherited in an autosomal dominant pattern. Clinically, it presents as a progressive decrease in central visual acuity, central and later peripheral visual field defects, and retinal ganglion cells loss. Biallelic inheritance leads to a more severe disease usually referred to as Behr syndrome.

Methods: This is a case report focuses on a family with Biallelic Optic Atrophy 1 (*OPA1*).

Results/case report: The proband is a 17-month-old child with a severe phenotype and two variants in the *OPA1* gene. The symptoms that he presented with were progressive vision loss, congenital nystagmus, progressive ataxia, and optic atrophy. Genetic testing showed two likely pathogenic variants in his *OPA1* gene: one of which was inherited maternally, c.2287del (p.Ser763Valfs*15), and the other was inherited paternally, c.1311A>G (p.Ille437Met). The first variant, c.2287del, is predicted to be pathogenic and likely to cause DOA. In contrast, c.1311A>G, on its own, is considered asymptomatic but has been reported in patients with the DOA phenotype and is presumed to act as a phenotypic modifier. On follow-up, the child developed a multitude of symptoms including profound vision impairment, metabolic strokes, and intractable seizures. Upon literature review, twenty-one cases of biallelic *OPA1*-related Behr syndrome have been previously reported.

Conclusion: An early-onset, severe ocular phenotype and associated systemic features, seem to be hallmarks of the disease.

Neck pain associated with headaches attributed to rhinosinusitis: an observational study 🌟

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Background/Aim: Neck pain is commonly associated with various headache types, including self-reported sinus headaches. Neck pain's association with headaches attributed to rhinosinusitis (HAR) diagnosed according to International Classification of Headache Disorders has not been investigated. The aim of this study was to determine if individuals diagnosed with HAR report neck pain and disability.

Methods: This was an observational study. Eighty total participants, including a HAR group and a non-headache group, attended one data collection session. All participants reported whether they get neck pain and completed the Neck Disability Index and Sino-Nasal Outcome Test-22 (SNOT). Additionally, the HAR group completed the Headache Impact Test (HIT-6) and the Visual Analog Scale (VAS). Data analysis included means (SD) for headache duration, HIT-6, and VAS scores in the HAR group. Between group differences were analyzed, with independent *t*-tests for continuous variables and χ^2 for dichotomous variables.

Results: There were significant between group differences for neck pain (p<0.001) and disability (p<0.001). In the HAR group 82.5% reported neck pain of moderate disability; 25% of the non-headache group reported neck pain but no associated disability.

Significance/ Conclusion: Neck pain is common in HAR. Patients with HAR perceive neck pain as impacting their quality of life. Clinicians should consider NP as a potential comorbidity when examining and treating people with HAR. Further research is needed to determine potential causes and treatment implications.

Incidence and characteristics of concomitant bacterial infection in ED patients admitted to the hospital with a positive viral target on FilmArray Respiratory panel ♦ 72 G ♦

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Background*:* This study sought to determine the frequency and associated clinical variables of concomitant bacterial infection present in patients admitted to the hospital with a positive viral target on molecular testing in the Emergency Department.

Methods*:* A retrospective observational study was conducted at three EDs in the greater Des Moines area between July and December 2022. Inclusion criteria included patients admitted to the hospital with a positive viral target on FilmArray Respiratory Panel (FARP). A multidisciplinary chart review classified patients as viral infection only or viral plus concomitant bacterial infection. Only infections deemed to be present on admission were reviewed.

Results*:* During the six-month period, 395 patients with positive FARP were admitted to the hospital. Among those hospitalized, 77% were categorized as viral only infections (Vi) and 22% categorized as a concomitant bacterial infection (ViCon). Bandemia >10% was more common in ViCon group compared to (VI) group (15.00% vs 1.19%, *p = 0.005)*. Procalcitonin values were higher in ViCon vs Vi group as well (10.6 vs 1.5, *p = 0.012).* Antibiotic days of therapy (DOT) for Vi patients was shorter than the ViCon group (4.41 DOT vs 8.22 DOT, *p < 0.0001).* Finally, the PPV for concomitant bacterial infection with bandemia ≥5% and ≥10% were 0.81 and 0.692, respectively.

Conclusion: This study opens the door to develop parameters for bandemia and procalcitonin levels to aid in clinical decision making when considering the need for antibiotic treatment in patients being admitted to the hospital with a positive viral FARP and potential bacterial concomitant infection.

Challenges in Project Development for Adolescent Sports-Related Concussion Baseline Testing ♦ 73 G ♦

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Background: There are a variety of tests available to determine the severity of sports-related concussions (SRC). The primary project aim was to determine a battery of baseline concussion assessments for youth athletes, which could be used by clinicians in diagnosing SRC. Through project development, certain challenges were encountered, delaying the process. The secondary aim was to evaluate an engaging neuro-cognitive tool (BlazePods[TM]) to enhance athlete motivation during testing.

Methods: A literature review was completed to evaluate the psychometrics of available concussion and neuro-cognitive tests. Medline and CINAHL were searched using the terms: "concussion", "neurocognitive", "diagnosis", "sports", and "athletes". Delimiters included 2000-2022 and the English language. Protocol development included pilot testing concussion assessments with college-aged individuals and high school athletes in clinical settings.

Outcomes: Literature identified a battery of tests assessing oculomotor, cognitive ability, response time, and symptoms in participants to determine if further assessment would be necessary. The delays in project

progression were due to the timeline in the IRB approval process, scheduling conflict with education delivery for parental consent and participant assent, and the perception of combining research and athletic training services.

Future Work: Additional work will include investigating the feasibility of determining the reliability and validity of available tests for baseline concussion testing using a retrospective methodology. Ongoing efforts continue to mitigate challenges associated with testing adolescents.

EDUCATION

"Even I can do AI!" Some examples of machine learning in aiding medical education and clinical practice.   ♦ 31 G ♦

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Artificial intelligence (AI) is rapidly becoming an integral part of our modern lives. From a clinical and biomedical perspective, AI promises much for accelerating our diagnostic and prediction abilities as well as better serving the healthcare needs of our communities. However, the speed at which these modalities continue to develop and the ongoing challenge of bridging the divide between the highly technical language of neural networks and its application by non-expert users, has proved a formidable obstacle. In the following study, we present examples of exploratory uses of AI technology by DMU faculty, staff and students and highlight resources as well the application of these technologies to members of the healthcare and medical education community.

Mixed methods analysis of diversity and equity education: Perspectives from third year medical students   ♦ 32 G ♦

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Delivering culturally and socially responsive healthcare is an important part of being a physician. To address this need, first-year medical students at Des Moines University (DMU) take "Foundations of Physicianship" (FOP). The course has four themes: identity, communication, bias, and epidemiology. Within each theme, students engage with content through community panels, group discussions, learning modules, and engagement activities.
All students (N=215) were invited to complete pre- and post-course surveys to assess their abilities and comfort level in providing culturally and socially responsive healthcare. This qualitative and quantitative research assessed third-year students' perspectives and how FOP prepared them on rotations.

We asked students to consider a specific clinical encounter on rotations when they worked with a patient with an identity different from theirs and comment on: 1) how they applied something from FOP, 2) what they felt unprepared for, and 3) how FOP could have better prepared them. Students discussed using listening and motivational interviewing skills. They reported feeling unprepared for knowing which resources to provide patients and working with language barriers. Finally, students wanted to learn more about providing care for patients from various backgrounds and learning through practice scenarios.

Third-year students also rated their encounters with culturally and socially responsive healthcare and experiences working with patients with backgrounds different from theirs. Overall, most students reported feeling prepared in these areas.

This novel information can help DMU faculty shape curriculum to fit the needs of medical students throughout their preclinical and clinical years, overall improving culturally and socially responsive healthcare.

Learning goals, outcomes, and impactful course elements in diversity, equity, and inclusion education: A mixed methods analysis ♦ 75 G ♦

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Diversity, equity, and inclusion education are important elements in the medical school curriculum for future providers. The Physician as a Professional Course for first year DO students at Des Moines University provides an opportunity for students to learn about their own biases, attitudes, and cultural humility as it relates to the patient populations they will serve in the future. Within the course, students are asked to complete a pre-course survey in which a subset of questions asked about identification of individualized learning goals and patient populations they would like to know more about, in support of the self-directed learning components of the course. Additionally, the students participate in a post-course survey that includes identification of what they learned the most about, their satisfaction with the course content regarding their learning goals, and their qualitative suggestions for improvement in course content, logistics, etc. The surveys are a course assignment, with optional research participation (N=201/220 students consented for research inclusion). Overall, 93.7 percent of students reported at least some sort of satisfaction with the course regarding their individualized learning goals. The students found many elements of the course to be helpful, but some students identified their own actions outside of the self-directed modules to be most helpful. Thematic and frequency analysis of the qualitative data revealed a wide range of feedback. The insight provided by students allows for continued growth and modification of the course content, objectives, and format for future students.

Addressing the gap: didactics on health care disparities by medical students in their Internal Medicine core rotation ♦ 33 F ♦

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The American Association of Colleges of Osteopathic Medicine (AACOM) Foundational Core Competencies for Undergraduate Medical Students, published in 2012, emphasizes the need to identify sources of disparities in population's health and access to care as part of the Practice-Based Learning and Improvement competency. Third-year medical school course structure does not have formal academic activities dedicated to the instruction of population health disparities. The 3rd year medical school Internal Medicine core rotation is a 4-week duration course, with multiple clinical sites located in a diverse geographic area throughout the country. Didactic meetings for all students are conducted once a week using a virtual platform. Students are required to

do a brief 5-minute slide presentation on a preselected Internal Medicine topic. To provide a baseline background on population health disparities to the whole group, the topic review assignment included a search of the literature on related health care disparities and presentation of the findings to their peers. Threading spaces to discuss population health disparities into the core clerkship rotations didactics could be a strategy to increase the much-needed awareness, contribute to the fulfillment of the AACOM competency requirements and motivate the future generations to actively engage in narrowing the gaps in health care outcomes.

The influence of psychiatry clerkship's setting and nature on students' attitudes and empathy towards patients with mental illness ♦ 34 G ♦

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Purpose: The National Alliance on Mental Illness Provider Education Program is a required curricular program at Des Moines University aimed at increasing health care professionals' delivery of patient-centered and collaborative care for patients with mental illness (MI). This study assesses how the nature of setting and location of psychiatry clerkship influences OMS-III students' attitudes and empathy towards patients with MI diagnoses from baseline to 6-month follow-up.

Methods: Participants completed surveys assessing their affect, beliefs and behavioral intentions regarding individuals with MI. The predictors were inpatient psychiatric unit training and training at more than 1 clinical setting during psychiatry clinical rotation. Outcomes included the medical condition regard scale (MCRS) and the 7-item Day's Anxiety Scale (DMISS). The MCRS measured "regard" for patients with auditory hallucinations and paranoid delusions and patients with comorbid hallucinations, delusions, and substance use disorder. The DMISS assessed anxiety about interacting with individuals with MI. We calculated change scores for outcomes of interest. Baseline vs 6-month change score association were performed using independent samples t-tests with a significance cutoff of $p<0.05$. Cohen's d effect sizes were calculated ($d\geq0.20$=small, ≥0.50=medium, and ≥0.80=large).

Results: Overall, students who completed their psychiatry clerkship in more than one clinical site had lower levels of anxiety about interacting with someone with MI ($t(91)=0.418$, $p<0.042$, $d=0.44$). Students who completed their psychiatry clerkship in an inpatient psychiatric unit compared to all other settings of psychiatry clinical rotation displayed better regard towards patients with MI ($t(86)=2.519$, $p<0.005$, $d=0.64$) and towards patients with MI with comorbid substance use ($t(85)=2.185$, $p<0.02$, $d=0.44$).

Ultrasound education at Des Moines University ♦ 35 G ♦

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Introduction: The ultrasound curriculum at Des Moines University started in 2015 and was fully functional in 2017. This study questioned 178 DMU students about the first-year ultrasound curriculum.

Methods: The survey questions consisted of mostly five-option Likert scale and one dichotomous question. In spring of 2023, we reviewed ultrasound training in specific areas of education such as anatomy, cardiovascular physiology, clinical medicine, and trauma evaluation.

Results: The students had a positive ultrasound experience at DMU with 44.5% responding that their experience exceeded expectations or far exceeded expectations, and 33.55% responding with equaled expectations. When asked if ultrasound improved their understanding of basic anatomy, 53.2% of students agreed or strongly agreed. 96.8% of students would like to have more ultrasound workshops after imaging-based anatomy lectures. 67.94% of students agreed or strongly agreed that ultrasound improved their understanding of cardiovascular physiology. 73.7% of students agreed or strongly agreed that ultrasound improved their learning of clinical medicine. 96.10% of responses indicated that including ultrasound in systems courses would help them better understand the principles of clinical ultrasound. 73.6% of students agreed or strongly agreed that learning the FAST exam enhanced their knowledge of trauma evaluation.

Conclusion: Ultrasound has shown to be beneficial in better understanding clinical medicine, trauma, anatomy, and physiology. Not only has it improved students' knowledge of these concepts, but students also identified that they would benefit from more incorporation of ultrasound into their education. This survey revealed that the ultrasound curriculum is well received by osteopathic medical students at DMU.

Evaluation of an Emergency Medicine Ultrasound Workshop at Des Moines University ♦ 36 G ♦

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With the increasing prevalence of point-of-care ultrasound (POCUS) in various medical domains, ensuring appropriate training is imperative to fully leverage the benefits of this imaging modality. Des Moines University has conducted an emergency medicine ultrasound (US) workshop for the past four years, catering to physicians, residents, healthcare professionals, and students. This study aimed to evaluate the workshop's effectiveness by assessing the responses of attendees from 2019 to 2023. The methodology involved administering an end-of-course survey at the conclusion of each live workshop to gauge the participants' reactions to the meeting and overall satisfaction. The survey encompassed various aspects of the emergency medicine US workshop, including facilitator quality, teaching methods' efficacy, safety measures understanding, and competence in describing interventions in POCUS for emergency medicine. The survey was evaluated based on Likert scale options. Analysis of the survey data revealed consistently positive responses from emergency medicine students across the mentioned years. All participants rated the facilitators' quality, appropriateness for future practice, and identification of relevant anatomy as either "excellent" or "very good,". This multi-year analysis substantiates the workshop's consistent effectiveness in meeting and surpassing educational objectives. Des Moines University's emergency medicine ultrasound workshop has demonstrated a substantial positive influence on physicians, residents, healthcare professionals, and students over its four-year duration. This emphasizes the critical role of comprehensive training in fostering proficiency in ultrasound operation, interpretation, and diagnostic decision-making, portraying the workshop as a highly valuable and positively impactful educational experience for all participants.

Survey of Physician Assistant Curriculum in Ultrasound at Des Moines University ♦ 37 G ♦

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There is great interest nationwide in integrating ultrasound into the physician assistant (PA) curriculum over the recent years. Two of the biggest challenges that impair implementation of ultrasound into PA programs are lack of access to ultrasound machines and trained faculty. Des Moines University started ultrasound training for the PA program in their first year since 2017. The PA ultrasound curriculum consists of ultrasound teaching or training in didactic lectures, anatomy, cardiac physiology, vascular ultrasound, muscular skeletal ultrasound, FAST exam, and central line placement. A three-year survey of the PA ultrasound curriculum was conducted showing that the students significantly favored ultrasound teaching or training in didactic lectures, anatomy, cardiac physiology, and vascular ultrasound. Muscular skeletal ultrasound, FAST exam, and central line placement were not significantly favored with the least favored being central line placement. This shows a solid ultrasound curriculum for PA that is well received at DMU and has room for improvement. Areas of future improvement will be based in student evaluations and survey data. DMU is committed to ultrasound training in the College of Health Sciences, and the PA program are leaders in advancing ultrasound within their college.

Pathology Teaching Methods in Different Curricula in Undergraduate Medical Education: A Pilot Study ♦ 38 G ♦

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Introduction: There are many different versions of curricula at medical schools which makes it difficult to understand the teaching methods and pathology subjects being taught. We compared the different teaching methods in general and systemic pathology within traditional curricula (TC), semi-integrated curricula (SIC), and integrated curricula(IC) from fourteen medical schools.

Methods: A pathology survey was sent out to evaluate general and systemic pathology teaching methods taught at medical schools with different curricula affiliated with Group Research in Pathology Education. Pathology lecture hours, TBL hours, PBL hours, and hours spent in other forms of teaching pathology were counted and compared in general pathology and systems pathology subjects in four schools with TC, four schools with SIC, and six schools with IC.

Results: The total number of mean lecture hours taught in general and systemic pathology was greater in traditional curricula (TC) than integrated (IC) or semi-integrated (SIC) curricula (TC-153 hours vs IC-104 hours vs SIC-73.1 hours). Overall active learning methods using PBL and TBL had much greater hours in IC compared TC (IC-267.5 hours vs TC-52 hours) with PBL being the most utilized method in both general pathology and systemic pathology (IC-171 total hours). Lastly, other teaching methods total hours were greater in IC compared to SIC or TC (IC-103.3 hours vs SIC-32 hours vs TC-24.5 hours).

Conclusion: Lectures are the most preferred method of teaching in TC where active learning methods such as PBL are utilized more in the IC. IC also utilized other teaching methods more than other curricula.

MOVEMENT SCIENCE

Asymmetry in bilateral scapulothoracic motion and scapular dyskinesis ♦ 27 G ♦

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Scapular Dyskinesis (SD) refers to improper movement of the scapulothoracic (ST) joint, manifesting secondary to or causative of pathology. Scapular dyskinesis is clinically assessed/categorized based on observational asymmetries of scapular segmental prominence and ST upward rotation (UR), internal/external rotation (IER) and anterior/posterior tilt (APT). Bilateral ST motion symmetry is assumed in healthy individuals. The diagnostic distinction between non-pathological and pathological asymmetry for SD has not been elucidated.

This experimental study assesses bilateral ST 3D-motion using simultaneously a laboratory camera-based validated passive reflective marker methodology (acromion marker clusters – AMC) and a non-invasive portable/clinically-feasible technology (inertia measurement units – IMU). The IMU derived 3D ST motion and asymmetry will be validated against the AMC system over six (6) bilateral simple arm elevation and compound tasks. Our experimental protocol is in progress with 7 of 15 right-handed, male, healthy subjects enrolled.

Assessment of bilateral ST asymmetry has been reported as related to arm dominance, healthy-overhead athletes, and sex, with the latter two lacking sufficient consistency for comparison across studies. Specific to arm dominance, average bilateral ST motion differences across all planes of arm elevation are 2.95°, 1.39° and – 1.92° for UR, APT and IER, respectively. These differences were observed on average dominant and non-dominant ST: UR of 34.2° and 32.65°, APT of 11.56° and 10.06°, and IER of 4.17° and 3.08°, respectively.

The literature and our experimental data will be used to validate the IMU accuracy for the clinical setting and to determine acceptable ranges for non-pathological baselines for 3D ST motion and asymmetry.

The relationship of cervical range of motion and movement control with temporomandibular dysfunction: A pilot study ♦ 28 G ♦

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Evidence exists that cervical posture is associated with temporomandibular joint dysfunction (TMD). Few studies have examined cervical spine active range of motion and cervical movement control in subjects with TMD. The purpose of this study is to pilot a protocol comparing cervical spine range of motion and cervical movement control between subjects with and without TMD.

Subjects include individuals 18-60 years of age with or without the presence of TMD signs/symptoms of jaw pain, limited jaw motion, or joint noise. Subjects exclude those with history of jaw or cervical spine surgery within 5 years, history of joint disease of the temporomandibular joint (TMJ) or cervical spine, cervical or TMD symptoms under active treatment by a healthcare provider, moderate or severe neck disability as identified by the Neck Disability Index (NDI), systemic disease impacting the cervical spine or TMJ, and subjects who are pregnant.

Data collection has been initiated and includes: TMJ Disability Index and NDI scores, active cervical range of motion for six physiologic motions, cervical movement control tests described by Patrocini et al. (2014), active maximal mouth opening and lateral deviation and TMD subgroup classification. Cervical movement control will be scored by a physical therapist with > 10years of experience blinded to subject classification into the control or TMD groups. Tests specific to the TMJ will be completed by a physical therapist with > 10 years of experience blinded to the cervical movement control scores.

A new look at the dynamic measurement of foot arch stiffness during gait ♦ 29 G ♦

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Foot arch stiffness is a modifiable, clinically relevant biomechanical metric. Static arch stiffness is insufficient in representing dynamic arch behavior, while dynamic arch stiffness has only been measured using surrogate variables or at an arbitrary timepoint (mid-stance). We proposed that dynamic arch stiffness instead be assessed using the medial longitudinal arch angle (MLAA) at the time of its maximal deformation, defining medial longitudinal arch stiffness (MLAS). We evaluated (1) the test-retest reliability of MLAS and (2) the effect of walking speed on MLAS.

Subjects (*n*=56) completed 3-5 walking trials each at a self-selected typical speed on a walkway equipped with force plates and a motion-capture system. Reflective markers were placed on the foot, with calcaneal, navicular, and first metatarsal head markers subsequently used for the MLAA calculation. A subset of the subject pool (*n*=21) also completed walking trials at self-selected slow and fast speeds, and eight (*8*) of these subjects returned at a later date for an identical retest.
On average, the timing of peak MLAA deformation (tMLAAmax) occurred at 71.0 ±8.8% of the stance phase, and the MLAS was 8.93 ±4.47deg/kN. The Pearson *r* showed high test-retest reliability for tMLAAmax (0.792, *p*=.019) and MLAS (0.768, *p*=.026). A significant increase in arch stiffness was found with increasing walking speed (*F*=10.686, *p*=.004).

The MLAS measurement proposed here was found to be highly reliable, and tMLAAmax was shown to occur well after mid-stance. The MLAS change corroborates existing evidence suggesting a stiffer arch as walking speed increases.

The effects of protein and carbohydrate supplementation, with and without creatine, on occupational performance in firefighters ♦ 30 G ♦

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Background: The purpose of this study was to assess the effects of protein and carbohydrate supplementation, with and without creatine, on occupational performance in firefighters. Methods: Using a randomized, double-blind approach, thirty male firefighters (age: 34.4 ± 8.4 yrs., height: 1.82 ± 0.07 m; weight: 88.6 ± 12.5 kg; BF%: 17.2 ± 5.8 %) were randomized to receive either A.) 25 g of whey protein isolate + 25 g of carbohydrate powder (ProCarb group); B.) ProCarb + 5 g of creatine (Creatine group) in a double-blind fashion over a period of 21-26 days (depending on shift rotations) to evaluate the impact of supplementation on occupation-specific performance. At baseline and following supplementation, firefighters completed a battery of tests. These tests included an aerobic speed test on an air-braked cycle ergometer followed by the hose carry, body drag, stair climb, and Keiser sled hammer for time. Results: No significant differences in measures of performance were observed at baseline (p > 0.05). There was a significant main effect for time observed for rescue, stair climb, total time to completion, and time trial performance (p < 0.05). There was a significant

group x time (p < 0.05) interaction for rescue and forcible entry. Independent-sample t-tests indicated that the Creatine group experienced a greater reduction (from baseline) in completion for the rescue (1.78 ± 0.57 sec, 95% CI: 0.61, 2.95 sec, p = 0.004) and forcible entry (2.66 ± 0.97 sec, 95% CI: 0.68, 4.65 sec, p = 0.01) tests compared to the ProCarb group. No significant group x time interactions were observed for hose line advance, stair climb, total time to completion, and time trial performance (p > 0.05). Conclusions: The addition of supplemental creatine to a protein and carbohydrate supplement to the diet of career firefighters throughout a three-week period improves occupational performance in firefighters in specific areas of high-intensity, repetitive actions.

PUBLICHEALTH

Non-Hispanic Black women face staggering hypertension rates and ineffective treatment Outcomes ♦ 39 G ♦

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Nearly half of the adult population has hypertension, with the incidence increasing as people age. Hypertension is a major risk factor for cardiovascular disease and uncontrolled high blood pressure can lead to stroke, myocardial infarction, heart failure, end-organ damage, and early death. Hypertension costs the United States billions of dollars every year in hospital fees. On average, men develop high blood pressure at earlier ages, however, hypertension poses a greater burden for women than men. Non-Hispanic Black (NHB) women are particularly susceptible to developing hypertension and have a higher prevalence than black men at any age over 20. Various factors contribute to the current trend that is seen for NHB people in the United States including the pathophysiology of hypertension in those of African ancestry, lack of education, increased weight, discrimination, and management of hypertension. These factors, however, do not fully explain why NHB women have higher rates of hypertension than NHB men, especially when the opposite trend is often seen with women of other races. Some studies suggest stress and stigma as important factors in the development of high blood pressure for NHB women. Still, many gaps in knowledge persist. This review aims to address some of those gaps, such as if there is a gene that makes NHB women particularly susceptible to salt intake and if this pattern of hypertension is seen with NHB women in other parts of the world, and if not, what factors may be contributing to these differences in blood pressure.

Race and poverty as confounders for increased antihypertensives in NHANES 2013-2020 respondents 🌟

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Background: This study explores the relationship between one's number of antihypertensive prescriptions (AHPs) and the confluence of demographic factors including race, gender, education, and poverty level.

Methods: 2013 to pre-pandemic 2020 NHANES responses were utilized. Respondents aged 18+ with ≥1 AHP for an ICD-10 code for "essential hypertension" or "hypertension prevention" were included. GraphPad Prism 10 was used for analyses.

Results: Multiple linear regression controlling for age, gender, race, education, birthplace, and marital status was significant (R^2 =0.023 , $F(16, 2791)=4.159$, $p<0.0001$). More AHPs were prescribed at 1x to <5x poverty vs. ≥5x poverty ($\beta=-0.0985$, $p=0.0271$).

Two-way regression controlling for age and gender was significant (R^2 =0.020, $F(23, 2784)=2.508$, $p<0.0001$). Non-Hispanic Black respondents 1x to <5x poverty predicted more AHPs vs. Non-Hispanic White below ($\beta=-0.1531$, $p=0.241$) or ≥5x ($\beta=-0.3483$, $p<0.0001$) poverty.

Adjusting for race, education, and birthplace, there was no significant difference in number of AHPs between genders ($\beta=-0.0203$, $p=0.347$). GED/high school graduation did not predict differences in AHPs vs. education <9th grade ($\beta=-0.0526$, $p=0.2053$), 9-11th grade ($\beta=0.0280$, $p=0.437$), some college ($\beta=0.0230$, $p=0.4304$), or college graduation ($\beta=-0.0176$, $p=0.5848$).

Conclusion: Non-Hispanic Black individuals and those living between 1x and 5x poverty level were associated with more AHP prescriptions. This points to potential bias in prescription of antihypertensives.

Biosimilar insulin glargine utilization in Medicaid: How interchangeability and other policy factors affect variation across states ♦ 40 G ♦

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Background: In 2021, an insulin glargine biosimilar received an "interchangeable" designation, which, where allowed, enables pharmacists to automatically substitute these biosimilars when a reference product is prescribed. This project explored adoption of insulin glargine biosimilars across state Medicaid programs, all of which have unique characteristics.

Methods: Medicaid State Drug Utilization Data for all insulin glargine products between 2020-2022 were utilized to determine how biosimilar market shares varied according to state laws regarding pharmacist substitution, state Medicaid program structure, and utilization of preferred drug lists (PDLs). Kruskal-Wallis tests were used to compare the market shares of biosimilar insulin glargine across different groups of states based on their characteristics.

Results: Across state Medicaid programs, mean quarterly market shares for biosimilar insulin glargine was 28.7% (SD = 36.2%, range = 0% - 95%) in 2020, 25.9% (SD = 35.8%, range = 0% - 95%) in 2021, and 28.1% (SD = 36.9%, range = 0% - 95%) in 2022. Use of interchangeable insulin glargine was higher among states that lacked regulatory authority to automatically substitute for interchangeable biosimilars; 13% vs. 8.8%; $p < 0.01$). Market shares of interchangeable insulin glargine were also highest among state Medicaid programs with MCOs that were not subject to statewide PDLs for insulin glargine (18.9%)

Conclusions: Biosimilar usage increased following introduction of an interchangeable product, but also varied considerably among state Medicaid programs. Many factors among state Medicaid programs may contribute to underutilization of biosimilars, and revisiting these factors at the state level may improve access for patients.

The recent sudden decline in female adolescent mental health ♦ 41 G ♦

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According to the Centers for Disease Control and Prevention's 2011-2021 Youth Risk Behavior Survey, female adolescent mental health has significantly declined in the recent decade. There has been a 21% increase in persistent feelings of sadness or hopelessness among female adolescents compared to an 8% increase among their male peers. Though the 21% increase in feelings analogous to depression occurred between 2011 and 2021, much of this trend is represented by a sharp decline in female adolescent mental health post-2017. This poster aims to present a scoping review of over 50 published articles to account for both trends. Articles were selected based on their relevance to the American female adolescent population with a majority of articles selected from *Pediatrics*, *Journal of the American Academy of Child and Adolescent Psychiatry*, and the Pew Research Center. Other sources were complied through targeted searches utilizing PubMed and ClinicalKey. Decade trends in the decline of female adolescent health correlated to predominately female substance abuse, lack of mental health care for both teens and their caregivers, a shift to more females pursuing higher education, potential climate change stress, lack of school belonging, general female risk for depression, propensity to females being victims of violence, and the most popular forms of media depicting poor mental health often through inaccurate representations. The sharp decline in female adolescent mental health post-2017 was correlated to the COVID-19 pandemic, increasing social media use, and increasing radicalization experienced by female youths in America.

Association of eating speed and rate with adult obesity: an exploratory review ♦ 42 G ♦

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Background: Obesity is a multifactorial chronic disorder. The evidence on the association of eating rate and speed with adult obesity has been growing.

Objective: To understand the association of eating rate and speed with adult obesity.

Methods : PubMed was the sole database used to identify the studies. To search the literature, eating rate, eating speed, and obesity were used as keywords, and one Boolean operator ('and') was used to link eating speed/rate to obesity. Exclusion criteria included studies published after August 31st, 2023, and publications included in previous systematic reviews published within the past 15 years.

Results: The 3 identified studies were all cross-sectional and used questionnaires to collect subjective data on eating rate and speed as exposure, of which one also included an objective evaluation of eating rate measured as chews per bite. All studies collected data on body mass index and waist circumference to define outcomes, including general and central obesity, respectively. These studies differed in statistical methods and reported significant relations between the exposure and outcomes. However, the association remained statistically significant in only one study after adjusting for confounding factors.

Conclusions: Subjective evaluation of eating speed and rate was common. Prior studies were inconsistent in the association of eating speed and rate with obesity after adjustment for confounding factors. A comprehensive scope review will be conducted to synthesize recent evidence on the association.

Effects of public health measures on the spread of COVID-19 ♦ 43 G ♦

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Before the discovery and widespread availability of the coronavirus vaccine, local, state, and federal agencies relied on various nonpharmaceutical interventions to decrease the pandemic's spread and mortality. Initially, these interventions were implemented with great variability and vigorousness until the Centers for Disease Control began to coordinate preventative efforts. Consequently, various actions drew criticism and raised questions about the efficacy of these procedures. With minimal research focused on the impact of different states' policies on COVID-19 infection rates, this research aims to determine the relative success of the different nonclinical interventions in lowering incidence rates.

To achieve our objective, we utilized the raw data archived at the repository for the 2019 Novel Coronavirus Visual Dashboard operated by the Johns Hopkins University Center for Systems Science and Engineering. Relevant data were extracted and inputted into R studio in order to convert data into graphical models. Trend lines were then superimposed to visualize how a measure affected the total number of cases on a weekly basis.

We found that, across all states, cases first peaked in April 2020 despite variations. Furthermore, cases stabilized during July 2020 across all states. Therefore, we believe that seasonal variations contributed the greatest impact to the spread of COVID-19 prior to the vaccine rollout.

The project's analysis demonstrates that while states varied in their policy measures and implementation, the trend of COVID-19 spread remained similar. These trends are likely due to weather patterns. We hope that the analysis performed will be helpful in future public health decisions.

An exploratory literature review of DNA methylation related to a rapid eating rate ♦ 44 G ♦

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Background: Obesity rates are rising worldwide and with it an increased risk for other conditions like cardiovascular disease and diabetes. One factor linked to obesity is the eating rate, defined as how fast an individual finishes a meal. However, little information is available about whether a rapid eating rate may epigenetically modify DNA or if there is an epigenetic predisposition in individuals with a rapid eating rate. We conducted an exploratory review to understand whether prior research identified a connection between eating rate and methylated DNA regions.

Methods: A keywords list was generated for both eating rate and methylation. An exploratory review of the literature in English was conducted through the PubMed database.

Results: The keyword list generated 97 possible publications tied to eating rate and methylation. Through the exploratory review, only 14 were identified as relevant. Of the 14 publications, 5 were human studies, 6 were animal experiments and the remaining 3 were reviews. A variety of DNA regions were epigenetically modified in subjects with a rapid eating rate, including hypomethylated genes related to binge eating disorder in adolescents. However, there was little overlap of DNA regions among the publications.

Conclusion: The relation of eating rate to methylation was investigated in previous studies, justifying a more thorough scoping review of the literature to identify DNA regions for future work.

Association between state ICU bed utilization and income-based equality rankings during the 2020 COVID-19 surge ♦ 45 G ♦

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The COVID-19 pandemic has strained healthcare systems in the United States, particularly hospital and ICU bed availability. We investigated the impact of income-based equality rankings on ICU bed utilization during the 2020 winter surge, hypothesizing the utilization of ICU beds is associated with the rankings of income-based equality among states. We conducted a cross-sectional study comparing different population-adjusted metrics of hospital bed and COVID-19 infection among three income-based equality state groups (upper-, middle-, and lower-rank). State-aggregated data of COVID-19 hospital cases was collected on November 29, 2020, and was further adjusted to the 2019 population data from the Census Bureau. The fifty states were grouped according to the income-based equality ranking. Mean values of the population-adjusted metrics of hospital bed and COVID-19 infection were compared among the groups with one-way ANOVA, followed by pairwise comparisons using the Tukey HSD procedure for multiple comparison adjustment. Log transformation was applied to the percent-based utilization data for better normal approximation. Low-rank states exhibited higher ICU bed utilization (9.4% increase, $p=0.022$) and staff shortage (12.8% increase, $p=0.0013$) compared to middle-rank states. Additionally, low-rank states had elevated COVID-19 inpatient bed utilization (16.4%) compared to upper- (10.5%, $p=0.039$) and middle-rank (11.9%, $p=0.0064$) states. Upper- and middle-rank states showed lower percentages of inpatients with COVID-19 infection ($p=0.019$, $p=0.036$). Our findings indicate states with higher income-based equality rankings performed significantly better regarding ICU bed utilization and staff shortages during the 2020 winter surge, emphasizing the need to address income-based disparities for improved healthcare delivery and emergency preparedness.

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<u>NOTES</u>