



DES MOINES
UNIVERSITY
MEDICINE & HEALTH SCIENCES

Research Symposium

DECEMBER 2, 2021

Des Moines University's Research Vision is to be ...

A cultivator of distinctive faculty and student researchers who discover and disseminate new knowledge.

WELCOME

Welcome to the 12th annual Des Moines University (DMU) Research Symposium!

The 2021 Research Symposium will showcase 90 interdisciplinary oral and poster presentations in anatomy and paleontology, biomedical science, clinical research, movement science, public health, and education research in the health sciences. Presenters include graduate and undergraduate students from DMU and surrounding local institutions, as well as faculty and members of the medical and scientific community.

The Symposium will include seven poster presentation breakout sessions which will allow participants to meet virtually to discuss the poster presentations in their area of interest and to network with others in similar research areas. There will be six oral presentations.

We are excited to welcome Stanley Perlman, MD, as our keynote speaker. Dr. Perlman is a University of Iowa Distinguished Professor and Professor of Microbiology and Immunology and of Pediatrics. Dr. Perlman's current research efforts are focused on coronavirus pathogenesis, including virus-induced demyelination and the Severe Acute Respiratory Syndrome (SARS), the Middle East Respiratory Syndrome (MERS), and COVID-19. He is a member of the VRBPAC of the FDA and the COVID-19 Advisory Committee of the ACIP (Advisory Committee on Immunization Practices).

DMU's research vision is to be "a cultivator of distinctive faculty and student researchers who discover and disseminate new knowledge." There is no event that captures this vision better than our Symposium, where the entire DMU campus comes together to recognize the efforts of our students, faculty, colleagues, and peers.

For some students, it is their first step into the formal world of research presentation. This Symposium is more than an opportunity to present research. It is an opportunity to discuss their work, receive constructive feedback, and establish relationships between future peers in the health professions. We celebrate their success by demonstrating the critical role research plays in the advancement of health care, providing a forum for the collaboration of ideas, and fostering the production of new hypotheses.

This Symposium demonstrates the strong research that is occurring on the DMU campus and in our community. As you attend the Symposium, we hope you will reflect on how the discoveries we are making in research today will impact the scientific and medical community, as well as the future of your patients.

Thank you for attending!

The DMU Office of Research

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AGENDA

| Thursday, December 2 | | | | |
|-------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|
| Welcome | 12:00 pm | Welcome Address Abigail Amissah-Arthur, PhD Senior Director of Research Administration, DMU | | |
| Keynote Address | 12:15 pm | 39 Years of Coronavirus Research: Insights into COVID-19 Stanley Perلمان, MD, PhD <i>Professor of Microbiology and Immunology, and Pediatrics, University of Iowa</i> | | |
| Oral Presentation Session 1 | 1:00 pm | Calmodulin availability regulates basal autophagy <u>Elizabeth McConnaha, MS, PhD'25</u> , Jennifer Giles, MA, Eric Wauson, PhD, and Quang-Kim Tran, MD, PhD | | |
| | 1:08 pm | Validation of the foot arch stiffness measurement in healthy non-symptomatic adults <u>William Bui Tran, DPM'23</u> , Vassilios Vardaxis, PhD | | |
| Poster Presentation Session 1 | 1:16 pm | Biomedical 1 | Clinical | |
| Break | 1:41 pm | | | |
| Oral Presentation Session 2 | 1:45 pm | NMDA receptor modulation in protracted ethanol withdrawal <u>Mercedes C. Foster, MBS'25</u> , Jennifer Giles, MA, Daniel T. Christian, PhD | | |
| | 1:53 pm | Reasons for COVID-19 vaccine hesitancy primarily among the Medicare population, associated disparities and methods to address the gap in vaccination rates <u>Nimo Nour, DO'24</u> , Tami Swenson, PhD | | |
| Poster Presentation Session 2 | 2:01 pm | Education | Movement | Public Health |
| Break | 2:26 pm | | | |
| Oral Presentation Session 3 | 2:30 pm | Potential renoprotective effects of chronic remote ischemic conditioning in a rodent model of sleep apnea <u>Benjamin G. Madigan, DO'24</u> , Katherine Harbeck, DO'24, Raina Gerritts, DO'24, Kalie A. Savage, DO'23, Sarah C. Clayton, PhD, Kiefer W. Kious, MS, Kelsey S. Schwartz, BS, James A. Lang, PhD, Noah J. Marcus, PhD | | |
| | 2:38 pm | Medial orbital floor thickness and asymmetry: implications for blow-out fractures <u>Michael A. Munafò, DO'24</u> , Lauren Butaric, PhD | | |
| Poster Presentation Session 3 | 2:46 pm | Biomedical 2 | | Anatomy |
| Awards/Closing Ceremony | 3:11 pm | | | |

2020 YEAR END SPONSORED PROJECTS GRANT STATS

32 FACULTY & STAFF
SUBMITTED GRANTS

54 EXTERNAL GRANTS SUBMITTED
33 RESEARCH // 21 NON-RESEARCH

27
EXTERNAL

INTERNAL
20

CURRENT GRANT
HOLDERS

186 STUDENTS TRAINED
FROM GRANT FUNDING



12
SUPPORTED
BY GRANTS



140
SUPPORTED BY
CURRICULUM



34 DMU STUDENTS PARTICIPATED IN THE
MENTORED STUDENT RESEARCH PROGRAM



ACCOMPLISHMENTS



81

RESEARCH SYMPOSIUM
PRESENTATIONS



29

PRESENTATIONS FROM
INTERNAL R&G GRANTS



478

RESEARCH SYMPOSIUM
ATTENDEES

AWARDS &
CONTRACTS
GRANTED

\$1,191,644
IN EXTERNAL AWARDS
13 research // 7 non-research

400% INCREASE
IN EXTERNAL DOLLARS
awarded from 2010 to 2020

PURPOSE

The Research Symposium aims to recognize the research efforts of those at Des Moines University and in the surrounding medical and scientific communities. The Symposium provides a forum for the collaboration of ideas, the production of new hypotheses, and demonstrates to attendees the critical role that research plays in the advancements of health care.

CONTINUING EDUCATION CREDIT

ACCREDITATION STATEMENTS

- **MD:** This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Iowa Medical Society (IMS). Des Moines University (DMU) is accredited by the IMS to provide continuing medical education for physicians. DMU designates this live activity for 3.0 *AMA PRA Category 1 Credit(s)*[™]. Physicians should claim only the credit commensurate with the extent of their participation in the activity.
- **DO:** Des Moines University (DMU) is accredited by the American Osteopathic Association (AOA) to provide osteopathic continuing medical education for physicians. DMU designates this program for a maximum of 3.0 AOA Category 2-B credits and will report CME and specialty credits commensurate with the extent of the physician's participation in this activity.
- **DPM:** Des Moines University (DMU) is approved by the Council on Podiatric Medical Education as a provider of continuing education in podiatric medicine. DMU has approved this activity for a maximum of 3.0 continuing education contact hours.
- **Nurse:** Des Moines University is Iowa Board of Nursing approved provider #112. This live activity has been reviewed and approved for 3.0 continuing education contact hour(s). No partial credit awarded.
- **Other healthcare providers:** This live activity is designated for 3.0 *AMA PRA Category 1 Credit(s)*[™].



EDUCATIONAL GRANTS

No commercial interest company provided financial support for this continuing education activity.

DISCLOSURE

The speaker(s) will disclose if any pharmaceuticals or medical procedures and devices discussed are investigational or unapproved for use by the U.S. Food and Drug Administration (FDA). Determination of educational content and the selection of speakers is the responsibility of the activity director.

Relevant to the content of this educational activity, the following individual(s) have no conflict(s) with commercial interest companies to disclose.

- Abigail Amisah-Arthur, PhD, Planning Committee Member
- Christina Billings, MPH, CHCP, Planning Committee Member
- Lori Byrd, MS, Planning Committee Member
- Vanessa Gray, MHA, CMP, CHCP, Planning Committee Member
- Stanley Perlman, MD, PhD - Speaker

DISCLAIMER

The information provided at this activity is for continuing education purposes only and is not meant to substitute for the independent medical judgment of a healthcare provider relative to diagnostic and treatment options of a specific patient's medical condition. The content of each presentation does not necessarily reflect the views of Des Moines University.

KEYNOTE ADDRESS



Dr. Stanley Perlman MD

University of Iowa Distinguished Professor

The University of Iowa

Professor of Microbiology and Immunology, and of Pediatrics

Dr. Perlman received his Ph.D. in Biophysics from M.I.T., Cambridge, Massachusetts and his M.D. from the University of Miami, Miami, Florida. He was trained in Pediatrics and Pediatric Infectious Diseases at Boston Children's Hospital, Boston, Massachusetts. He is a member of the VRBPAC of the FDA and the COVID-19 Advisory Committee of the ACIP (Advisory Committee on Immunization Practices).

His current research efforts are focused on coronavirus pathogenesis, including virus-induced demyelination and the Severe Acute Respiratory Syndrome (SARS), the Middle East Respiratory Syndrome (MERS) and COVID-19. His laboratory has developed several novel animal models useful for studying pathogenesis and evaluating vaccines and anti-viral therapies. His studies are directed at understanding why aged patients and mice developed more severe disease than younger individuals after infection with SARS-CoV or SARS-CoV-2 and also on why there is a male predominance in patients with more severe disease after infection with SARS-CoV, MERS-CoV or SARS-CoV-2. He and his colleagues demonstrated that transduction of mice with an adenovirus expressing the human receptor for MERS-CoV, DPP4, rendered them sensitive to infection, providing the first rodent model useful for studying MERS. Similar approaches have been used to develop several mouse models for COVID-19. Among other topics, his research is now focusing on the loss of sense of smell (anosmia) and taste (ageusia) observed in patients with COVID-19.

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 | Notes |
|-------------------------------------------------------------------------------------------------------|-------|
| 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. | |

| | Poster | Page |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|
| Presenting Author(s) in Bold. | | |
| G = Graduate U = Undergraduate F=Faculty/Staff | | |
| ANATOMY/PALEONTOLOGY | | |
| Infraorbital canal type and maxillary sinus size SaCora Osbon, DO/MSA'24 , Lauren Butaric, PhD | 1G | 14 |
| Atlas of subadult osteological development Hannah Porter, DO'24 , Andrea Stone, DO'24, Carlin Situmeang, DO'23, Heather Garvin, PhD | 2G | 14 |
| 3D reconstructions of the elephant brain Austin Teel, DO'24 , Ankit Chopra, DO'22, Mark Haagensen, Paul R. Manger, Muhammad A. Spocter, PhD | 3G | 14 |
| Quantitative MRI of chiari malformation in Cavalier King Charles Spaniels Stefan Lilly, DO'24 , Savanna Mayer, DO'22, Jordan Hass, Clare Rusbridge, Muhammad A. Spocter, PhD | 4G | 15 |
| Understanding the early Uintan transition in North America via small mammal fossils from the Sand Wash Basin, northwestern Colorado Salankara Bandyopadhyay, DO'24 , Rachel Dunn, PhD | 5G | 15 |
| A high-resolution MRI and preliminary atlas of cat brain Crystal Lee, DO'24 , Jenica Patel, DO'22, Cheuk Y. Tang, Patrick R. Hof, & Muhammad A. Spocter, PhD | 6G | 16 |
| Quantitative magnetic resonance imaging of the caudate nucleus in the Carnivora Michael Foster, DO'22 , Cheuk Y. Tang, Rogier B. Mars, Patrick R. Hof, Chet C. Sherwood, Paul R. Manger, Muhammad A. Spocter, PhD | 7G | 16 |
| Analysis of Minimum Kerf Widths to Predict Blade Thickness Ibrahim Mustaly, DO'24 , Heather Garvin, PhD | 8G | 16 |
| Comparative analysis of the neuropil space in the Carnivora Haley Spector, DO'24 , Ronald Olum, Jacob Nelson, DO'22, Erin Mary Woeste, DO'22, Kathleen Bitterman, Paul R. Manger, Chet C. Sherwood, Muhammad A. Spocter, PhD | 9G | 17 |
| Variables influencing minimum kerf width in dismemberment studies Alexis VanBaarle MSA'26 , Heather Garvin, PhD | 10G | 17 |
| Inter and intra reliability of orienting skull models Lily Horst, DO'24 , Gurankit Singh, DO'24, Lauren Butaric, PhD | 11G | 17 |
| Frontal sinus morphology as a forensic identification method: a comparison of intra-observer scores between scout radiographs and 3D skull images Patricia R. Avent, MSA'26 , Jessica L. Campbell, PhD, Heather M. Garvin, PhD, Lauren N. Butaric, PhD | 12G | 18 |
| Stabilization of frontal sinus traits with age: forensic implications Naeema Abdulrazak MSA'25 , Heather Garvin, PhD, Lauren Butaric, PhD | 13G | 18 |
| Medial orbital floor thickness and asymmetry: implications for blow-out fractures Michael A. Munafò, DO'24 , Lauren Butaric, PhD | 50G | 34 |

BIOMEDICAL SCIENCE 1

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| Exercise protects against inflammation by modulating rat hippocampal NF-kB and nucleus accumbens FosB/ Δ FosB Chia-Ming Lee, DO'24 , Lauren Points, PhD, Khaled Alganem, BS, Brock Pope, BS, Robert McCullumsmith, MD, PhD, LiLian Yuan, PhD | 14G | 19 |
| Requirement of optimal calmodulin binding for cardiac beta-1 adrenergic receptor functions Joshua Dunigan, DO'24 , Christina Bloomfield, Quang-Kim Tran, MD, PhD | 15G | 19 |
| Evaluation of DMD expression in pediatric Duchenne Muscular Dystrophy patients Hannah Pallister , Elitsa Ananieva, PhD, Holly Showalter, PhD | 17U | 20 |
| Chronic pain state mediates development of hippocampal and renal inflammatory responses Jeffery B. Foltz, MBS'25 , Victor Babich, PhD, Brittany Duong, Lori Winter, Francesca Di Sole, PhD, Vanja Duric, PhD | 18G | 20 |
| Obesity exacerbates renal injury in a model of ovarian hormone deficiency Patrick T. Walsh, DO/MBS'24 , Scott M. Johnson, DO'24, Victor Babich, PhD, Maria J. Barnes, PhD, Francesca Di Sole, PhD | 19G | 21 |
| Topical single inhibition of PI3K or mTOR pathways in mice with low-grade anal dysplasia Michael Poplawski DO'24 , Laura Gunder, MS, Tyra Moyer, Marissa Ziolkowski, Hillary Johnson, MD, Evie Carchman, MD | 22G | 22 |
| Screening and validation of FDA approved oncology drugs for induction of progesterone receptor expression in endometrial cancer cells Kayla Olstinske, PharmD'24 , Sarina Murray, BS, Xiangbing Meng, PhD, Shujie Yang, PhD | 23G | 23 |
| Effects of chronic intermittent hypoxia on renal cortical antioxidant and pro-fibrotic signaling in chronic heart failure Katie A. Harbeck, DO'24 , Benjamin G. Madigan, DO'24, Reagan Sesker, BS, Kiefer W. Kious, MS, Stephanie C. E. Twohey, BS, Noah J. Marcus, PhD | 24G | 23 |
| Neuronal nAChRs may exhibit subunit quantitative or functional change during withdrawal from an alcohol use disorder Tanner Wetzell, DO'24 , Daniel Christian, PhD | 25G | 24 |
| The effect of G1 pretreatment on LPS-induced MAPK activity Jodi Backalar, DO'24 , Eric Wauson, PhD | 30G | 26 |
| Regulation of lysosomal calcium dynamics by chloroquine Deanna Chan, DO'24 , Annie Yao, DO, Elizabeth McConaha, PhD'25, Jennifer Giles, MA, Quang-Kim Tran, MD, PhD | 31G | 26 |
| Biphasic effect of leptin treatment on free fatty acid accumulation in renal tubule cells Megan DeDecker, DO'24 , Adam Streicher, DO'22, Victor Babich, PhD, Maria J. Barnes, PhD, Francesca Di Sole, PhD | 33G | 27 |
| Increased NMDA receptor function during protracted withdrawal from chronic intermittent ethanol exposure Daniel T. Christian | 34F | 27 |
| The effects of remote ischemic conditioning on renal NLRP3 and iNOS levels in chronic intermittent hypoxia versus normoxia Aaron Hemsworth, DO'24 , Jiyeon Song, DO'24, Noah Marcus, PhD, Sarah Clayton, PhD | 43G | 31 |

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| Genetic profiling of the hippocampus during peripheral chronic inflammatory pain Adam Garman, MBS'22 , Allison Ash, Ellesavette Kokkinos, Dakota Nerland, Lori Winter and Vanja Duric | 44G | 31 |
| Effect of remote ischemic conditioning on hypothalamic NLRP3 and Iba1 expression in male rats subjected to chronic intermittent hypoxia versus normoxia Jiyoong Song, DO'24 , Aaron Hemsworth, DO'24, Noah Marcus, PhD, Sarah Clayton, PhD | 47G | 33 |
| Estrogen regulates voluntary running behavior in rats Victoria Mathis, MBS '22 , Lauren Points, PhD, Brock Pope, Lori Winter, Sarah Clayton, PhD, LiLian Yuan, PhD | 49G | 34 |
| Changes in AMPA receptor trafficking observed in protracted ethanol withdrawal Matthew Kvech, MBS'25 , Daniel Christian, PhD | 52G | 35 |
| BIOMEDICAL SCIENCE 2 | | |
| Olive: a super fruit for cervical cancer Nathan T. Givens, DO'24 , Chenlu Qin, Ziwen Zhu, Marco Lequio, Bradley D. Johnson, DO'24, Huaping Xiao, Qian Bai, Mark R. Wakefield, Yujiang Fang, MD, PhD | 16G | 20 |
| The BCKDH-E2 (DBT) gene is a putative novel target of the c-Myc oncogene in T cell lymphoma Ben Brik DO'24 , Michael Boyer, Aleyna Follet, MBS'25 and Elitsa Ananieva, PhD | 21G | 22 |
| Purifying 4- α -glucanotransferases from <i>T. vaginalis</i> Tarana Joshi, DO'24 , Wayne Wilson, PhD, Andrew Brittingham, PhD | 26G | 24 |
| SARS-CoV-2 spike protein inhibits growth of prostate cancer: a potential role of the COVID-19 vaccine killing two birds with one stone Bradley D. Johnson, DO'24 , Ziwen Zhu, Marco Lequio, Coby G.D. Powers, Qian Bai, Huaping Xiao, Emerson Fajardo, Mark R. Wakefield, Yujiang Fang, MD, PhD | 27G | 24 |
| Genomic screening affirms cytoskeletal destabilization as mechanism for boric acid toxicity in the pathogenic yeast <i>Candida Albicans</i> Martin Schmidt, PhD | 28F | 25 |
| Purification of an α -galactosidase from <i>Trichomonas vaginalis</i> Kelsie Linderblood, DO/MS'24 , Andrew Brittingham, PhD, Wayne A. Wilson, PhD | 29G | 25 |
| The role of SARS-CoV-2 spike protein in growth of cervical cancer: a possible encouraging link between COVID-19 vaccines and cancer Conner M. Willson, DO'24 , Marco Lequio, Ziwen Zhu, Mark R. Wakefield, Qian Bai, Emerson Fajardo, Huaping Xiao, Samuel Leung, Yujiang Fang, MD, PhD | 32G | 26 |
| Leptin activated cardio-regulatory neurons in the central nervous system Joshua Waits, DO'24 , Maria J. Barnes, PhD | 35G | 28 |
| Identifying novel mechanisms in which estrogen regulates blood pressure Sonia Martinez, DO'24 , Maria J. Barnes, PhD | 36G | 28 |
| Estradiol activates neurons in the paraventricular nucleus of aged ovariectomized mice Rebecca Lii, DO'24 , Maria J. Barnes, PhD | 37G | 29 |
| SARS-CoV-2 spike protein influences expression of ICAM-2 and ICOSL in prostate cancer cells McKay Echols, DO'24 , Coby G.D. Power, Ziwen Zhu, Marco Lequio, Qian Bai, Mark R. Wakefield, Yujiang Fang, MD, PhD | 38G | 29 |

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| Mangosteen, the queen of fruits, constrains growth of melanoma Mason J. Klisares , Ziwen Zhu, Vlad Husyev, Huaping Xiao, Marco Lequio, Qian Bai, Mark R. Wakefield, Yujiang Fang, MD, PhD | 39G | 29 |
| Olive extract inhibits growth of HeLa cervical cancer cells Love Patel, DO'24 , Ziwen Zhu, Jacob Hough, Marco Lequio, Qian Bai, Mark R. Wakefield, Yujiang Fang, MD, PhD | 40G | 30 |
| Mango: fruit for the enhancement of melanoma immunotherapy Ethan J. Anderson, DO'24 , Ziwen Zhu, Marco Lequio, Emerson Fajardo, Qian Bai, Mark R. Wakefield, Yujiang Fang, MD, PhD | 41G | 30 |
| The effect of olive on expression of costimulatory molecules OX40L and ICOSL in prostate cancer Alex Luong, DO'24 , Coby G.D. Power, Ziwen Zhu, Marco Lequio, Qian Bai, Mark R. Wakefield, Yujiang Fang, MD, PhD | 42G | 31 |
| The oncogene MYC targets the branched chain amino acid metabolism in human non-Hodgkin lymphoma Aleyna K. Follett MBS'25 , Michael Boyer, Elitsa Ananieva, PhD | 45G | 32 |
| A novel bacteriophage targeting the virulent opaque variant of <i>Acinetobacter baumannii</i> clinical isolate AB5075-UW exhibits a narrow host range Andrea Stone DO/MSA'24 , Faithe Keomanivong, PhD, Michael Carruthers, PhD | 46G | 32 |
| A comparative analysis of <i>TP53</i> gene expression in different female breast cancer tissues Puja Mekala , Elitsa Ananieva, PhD, Holly Showalter, PhD | 48U | 33 |
| Effects of MST-312 on herpes simplex virus glycoprotein D interactions with cellular receptors Dallan Blotter, DO'24 , Marie Nguyen, PhD | 51G | 34 |
| CLINICAL | | |
| Impact of fibrinogen and prothrombin concentrate on clotting time in a model of obstetric hemorrhage: an in-vitro study Daniel J. Katz, MD, Sharanpreet K. Hira, DO'24 , Matthew L. Sison, BS, Chloe S. Getrajdman, MD | 53G | 35 |
| Adherence to administration of calcium chloride via a central line Haley Miller, PharmD'22 , Kole Gallick, PharmD'22, Lynn Kassel, PharmD, BCPS, Mathew Hubble, PharmD, BCPS | 54G | 36 |
| The burden of adverse childhood experiences in children and those of their parents in a burn population Jia Ern Ong, DO'25 , Mikenzy Fassel, MD, Laura Scieszinski, BA, Sameen Hosseini, BSc, Colette Galet, PhD, Resmiye Oral, MD, Lucy Wibbenmeyer, MD, FACS | 55G | 36 |
| The link between osteopathic manual treatment (OMT) and proprioception Benjamin Hurley, DO'23, Samantha Hurtle, DO'23 , Jordan Little, DO'23, Kimberly Miller, DO'23, Jose Figueroa, DO, Chunfa Jie, PhD | 56G | 36 |
| Cervical range of motion among those with sinus headaches Shannon Petersen, DScPT, Brandon Krogman, DPT'22 , David Ferguson, MD | 57G | 37 |
| Incidence of chemical restraint with intramuscular olanzapine and ziprasidone at MercyOne Des Moines Medical Center Isabelle Tharp, PharmD'22 , Ryan Nulty, PharmD'22, Lynn Kassel, PharmD, BCPS, Matthew Hubble, PharmD, BCPS | 58G | 37 |

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| Optimal location of fixation for posterior tibial tendon transfers through the interosseous membrane Kaitlin Sebranek, DPM'24 , Ashley Dikis, DPM, FACFAS | 59G | 38 |
| Prophylactic antibiotic use in Gustillo Type III open fracture Andrea Saar, PharmD'22 , Britain Lehrer; Darla Eastman, PharmD, BCPS | 60G | 38 |
| Ankle joint articulation differences following ORIF of the fibula with and without deltoid ligament repair: a cadaver study Sean Grambart, DPM, Tyler Terhune, DPM'24 | 61G | 38 |
| EDUCATION | | |
| Digital accessibility: A practical approach Crystal Fierro, MS, MA , Heather Opseth, MPAS, PA-C | 62F | 39 |
| Cardiovascular outcomes of SGLT2 inhibitors in patients with/out diabetes and heart failure: a meta-analysis by sex and race Jamie A Rusan, PharmD'23 , Ronald Torry, PhD | 63G | 39 |
| Medical student reflections after participating in a sexual response team elective Cameron Slife DO'22 , Grace Binter, DO'22, Rebecca Shaw, MD, Mark LeDuc, DO, Paul Schenarts, MD | 64G | 39 |
| Are osteopathic medical students adequately informed about health policy? A review of osteopathic medical school curricula Guriqbal Bhullar, DO'24 , Darren Liu, DrPH | 65G | 40 |
| Importance of practical research experience and accomplishments for DMU student residency placement Martin Schmidt, PhD | 66F | 40 |
| Thematic analysis of medical student responses to diversity and equity education Lauren Young, DO'24 , Julia Van Liew, PhD | 67G | 41 |
| Optimal fixation techniques for subtalar arthrodesis Jordan Neyens, DPM'24, John Egdorf DPM'23, Reed Smith DPM'23, Tyler Tehune, DPM'24, Sean Grambart, DPM | 68G | 41 |
| Comparison of cultural competence level at matriculation for two doctor of physical therapy (DPT) cohorts Tracy Porter, PT, DPT, EdD, Emma Baker, DPT'23 , Vassilios Vardaxis, PhD | 69G | 41 |
| Formative assessment strategies to improve PA student knowledge in pharmacology Matthew Henry, PhD , Holland Taylor, MSPAS, PA-C | 70F | 42 |
| MOVEMENT SCIENCE | | |
| Indices of walking skill reflect differences in function in older adults with good mobility Madison Farren, DPT'22 , Kristin Lowry PT, PhD, Jessie Van Swearingen, PhD, PT, FAPTA, FGSA, Catherine Stevermer, PT, PhD, DPT | 71G | 42 |
| Center of pressure during curved path walking; inform approaches to restore walking motor skill Anthony McBroom, DPT'22 , Haley Hicks, Catherine Stevermer, PT, PhD, DPT, Patrick Roscher; Jessie VanSwearingen, PhD, PT, FAPTA, FGSA, Kristin Lowry, PT, PhD | 72G | 43 |
| Shoulder movement measurement validity and reliability and different measurement tools | 73G | 43 |

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| Jacob La Marche, DPT'24 , Vassilios Vardaxis, PhD | | |
| Scapulothoracic and scapulohumeral rhythm normative data: a systematic review Royal Cole, DO'24 , Micah Thatcher, DO'24, Jake Rodgers, DO'23, Vassilios Vardaxis, PhD | 74G | 43 |
| Is there a relationship between two quality of life measures in people with sinus headaches? Alexandra Hutchinson, DPT'22 , Shannon Petersen, DScPT, OCS Emeritus, FAAOMPT | 75G | 44 |
| Relationship between strength measures of selected intrinsic muscles of the foot and the dynamic stiffness of the arch during gait Madison Burandt DPM'23 , Ryan Bauermeister DPM'23, Vassilios Vardaxis, PhD | 76G | 44 |
| Asymmetry in runners with unilateral valgus-related conditions Taylor Vining, DPT'23 and Shane McClinton, DPT, PhD, OCS, FAAOMPT | 77G | 45 |
| Association of medial longitudinal arch stiffness with fifth metatarsal base external torque during gait and cross cuts. Implications to Jones Fracture. Daniel Lowe, DPM'23 , Robert Yoho, DPM, Vassilios Vardaxis, PhD | 78G | 45 |
| PUBLIC HEALTH | | |
| Wastewater surveillance for infectious disease: a systematic review Pruthvi Kilaru, MPH'25 , Dustin Hill, PhD, Kathryn Anderson, MD/PhD, Mary B. Collins PhD, Hyatt Green PhD, Brittany L. Kmush PhD, David A. Larsen, PhD | 79G | 45 |
| Racial-ethnic differences in off-label antipsychotic medication use among community-dwelling adults, 2001-2018 Dooyoung Lim, PhD, Benjamin Garrison, DO'24 , Darren Liu, DrPH | 80G | 46 |
| Queer in the heartland: Predictors of empirically derived substance use patterns Brian Vanderheyden, MEd, MPH'21 , Elizabeth Baker, PhD, Paul Gilbert, PhD, Christopher Wheldon, PhD | 81G | 46 |
| The association between patient's race and ethnicity and the use of first versus second generation antipsychotics among community-dwelling adults in the U.S. Dooyoung Lim, PhD, Brandy Bradell, DO'24 , Darren Liu, DrPH | 82G | 47 |
| Literature review: understanding mask non-adherence during COVID-19 pandemic Abigail Tarasewicz, DO'23 , Manoja Uppugunduri, DO'22, Lisa Streyffeler, PhD | 83G | 47 |
| Nationwide comparative analysis of COVID-19 vaccine adverse events using Vaccine Adverse Events Reporting System Nicholas Vipond, DO/MPH'24, Sara Belles DO/MPH' 24 , Simon Geletta, PhD, MS ,MSCIS, Jun Dai, MD, MSC, PhD, Tomislav Jelesijević, DVM, PHD, DACVP | 84G | 48 |

Infraorbital canal type and maxillary sinus size

SaCora Osbon, DO/MSA'24¹, Lauren Butaric, PhD²

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Due to its clinical implications, variations in the pathway of the infraorbital canal (IOC) through the maxillary sinus have been well documented. However, the precise relationship(s) between IOC and maxillary sinus morphology remain unexplored. This study assesses that relationship using a CT scans of 87 individuals (172 sides) from museum collections. Maxillary sinus height, length, and breadth were collected and used to calculate the geometric mean for overall sinus size. Three types of IOC were classified based on the amount of protrusion into the maxillary sinus: Type-I IOCs remained in the sinus roof; Type-II IOCs partially descend into the sinus; Type-III IOCs fully protrude into the sinus via a thin septum. Two multinomial logistic regression analyses were run to explore relationships: 1) IOC-type (dependent variable) versus sinus size (independent covariate) showed a significant fit (chi-square=34.575; p<0.0001); 2) IOC-type (dependent) versus all three sinus dimensions (independent covariates) also showed significance (chi-square=49.081; p<0.0001), with length (chi-square=10.799; p=0.005) and breadth (chi-square=8.306; p=0.016) being significant effects. In conclusion, there is evidence for an effect on IOC-type based on maxillary sinus size, particularly length. Specifically, larger, longer sinuses are associated with Type-3 (more protruding) IOCs. Procedures using anesthesia of the infraorbital nerve and endoscopic procedures within the maxillary sinus could benefit from knowledge of IOC protrusion, as there is greater risk for incomplete anesthetization and damaging a protruding nerve in a larger sinus, respectively. Integrating the knowledge of the relationship between maxillary sinus size and IOC type may help avoid errors during procedures.

◆ 2 G ◆

Atlas of subadult osteological development

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There are few resources documenting the changes in size, shape, and fusion pattern of skeletal elements throughout the entire human growth and development period. Forensic anthropologists rely on a few texts and the hand-drawn illustrations within them to visually understand these ontogenetic changes. This is due, in part, to the lack of subadult skeletal collections available to researchers and practitioners. The aim of this project is to create an atlas of human skeletal growth and development that practitioners can use as a quick reference or as a tool and learning guide. As part of a previous grant project (NIJ-2015-3985), epiphyseal fusion scores for all the long bones in a total sample of 1015 individuals were collected and descriptive statistics for the fusion by age were calculated. This project used those data to choose an individual for each year cohort that appeared to represent the average developmental progress for that age and created a 3D model of individual skeletal elements from the CT scans in AMIRA. Those 3D models were then post-processed in GeoMagic Wrap to remove extraneous elements, close any holes, and ensure that the skeletal element was an accurate representation of the bone. Two-dimensional images with scales were then extracted to create an atlas of skeletal development, with each chapter displaying a visual guide of the growth and development of a particular skeletal element (e.g., humerus), along with the descriptive statistics. The resultant atlas will provide a much needed resource to anyone interested in osteological development.

◆ 3 G ◆

3D reconstructions of the elephant brain

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The elephant is the largest land mammal and one of only a handful of living species belonging to the mammalian clade Afrotheria, which includes manatees, golden moles, tenrecs, hyraxes aardvarks and elephant shrews. Very little is known

about the elephant brain although in recent years a few studies using postmortem tissue have attempted to characterize its morphology in comparison to other large brained, social species. Here, using magnetic resonance imaging of postmortem ex situ brains from the three African elephants, we attempt to reconstruct the external surface anatomy of the elephant brain and derive estimates of the volume for the underlying white and grey matter. Manual segmentation was completed using the freeware ITKSNAP and resultant surface meshes were imported into Paraview for post processing. Preliminary reconstructions on this large mammalian brain (i.e., 5 kilograms in comparison to 1.3 kilograms in the human) have progressed incrementally given the large computational demands. Once complete, we anticipate that this data will form part of the first navigable 3D map and associated atlas of the elephant brain.

◆ 4 G ◆

Quantitative MRI of chiari malformation in Cavalier King Charles spaniels

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Chiari malformation is a structural defect in the base of the skull that results in the herniation of the cerebellum through the foramen magnum leading to compression of the brainstem and cerebellum. Given our limited understanding on this rare malformation, the goal of this project is to use data derived on a model species, the Cavalier Kings Charles (CKC) spaniel, a domestic dog breed which is known to have a high incidence of Chiari malformation. Through collaboration with the University of Surrey, a sample of 100 MRI brain scans from CKC spaniels was used to evaluate the differences in volume of the cerebrum and cerebellum for each specimen. The sample was randomized with normal individuals as well as individuals diagnosed with Chiari malformation and the researchers were blinded to the final diagnosis of the individual scans. Quantitative volumetric analysis was performed using the freeware ITKSNAP and both cerebral and cerebellar volumes were segmented and extracted before being compared with the blind diagnosis. Average cerebrum and cerebellar volumes within this domestic dog breed were 76.70 cm³ and 8.48 cm³ respectively. While preliminary, ongoing study of this data will include the construction of a correlative model to predict the interplay between relative cerebellar size and subsequent herniation. We hope this work will advance our understanding of this malformation in canids and provide a mechanistic understanding for the role of the cerebellar volume in the failure of the cranial base and subsequent onset of clinical signs.

◆ 5 G ◆

Understanding the early Uintan Transition in North America via small mammal fossils from the Sand Wash Basin, Northwestern Colorado

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Past climatic events and their effects on mammalian evolution can be used to model how current global climatic trends may affect extant animals and their environments in the future. Gradual climate cooling during the Uintan North American Land Mammal Age (NALMA) resulted in a period of significant faunal transition which led to the evolution of more than one-third of the mammalian families that exist today. Although the middle Uintan period has been well-characterized, the early Uintan transition period still shows great scope for exploration and classification. Sand Wash Basin (SWB) in Colorado yields fossils that may date to the early Uintan transition, however the fragmentary nature and poor documentation of the fossils from the area have led to ambiguity surrounding their age. The aim of this research is to gather, identify, and characterize fossilized dental samples of small and medium rodents from the SWB and compare them to fossil rodents from other sites of known age to clarify the faunal age of the SWB fossils. Dental measurements of fossil rodents relevant to the early Uintan faunal transition were collected from the literature. These data were then compared to measurements of rodent teeth collected from the SWB. Preliminary results indicate that some rodents found in the SWB are characteristic of the Uintan NALMA, however others are more similar to those from older time periods. Although analysis is ongoing, these results suggest that, at least the rodents from the SWB, belong to a transitional period at the beginning of the Uintan NALMA.

A high-resolution MRI and preliminary atlas of cat brain

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In recent years, there has been a resurgence of interest in domestic species, with several studies aimed at exploring the origins as well as comparative behavioral and anatomical differences between wild type and domestic varieties. Amongst these the domestic cat, a member of the Felidae which includes 41 cat-like species, has remained a rather underutilized model in comparative/ evolutionary neuroscience. The following study was aimed at providing a preliminary high-resolution MRI brain atlas of the cat brain, which could be used for direct comparisons with other members of the Felidae. Using postmortem MRI scan data, we provide a working MRI atlas and 3D reconstructions of select cortical and subcortical structures for volumetric comparisons. This project serves as a basis for helping to elucidate the neuroanatomical substrate supporting complex behavior within the Felidae.

Quantitative magnetic resonance imaging of the caudate nucleus in the Carnivora

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The caudate nucleus is a subcortical brain structure known to be involved in voluntary skeletal movements, including the planning, posture, speed and accuracy of directed movements. Carnivora are a highly specialized group of predatory mammals thus it stands to reason that this group of animals likely evolved very unique features within the caudate nucleus to support hunting behavior. To test this hypothesis, we performed 3D segmentations and associated comparative volumetric analysis of the caudate nucleus in isolated postmortem brains specimens. A series of high-quality bilateral reconstructions of the caudate nucleus were generated and compared allometrically with brain size. These preliminary data are interpreted within an evolutionary and ecological context.

Analysis of minimum kerf widths to predict blade thickness

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The main research objective of this dismemberment study was focused around two questions. The first question was can blade width be predicted from minimum kerf width. The second question was what is the measurement error in minimum kerf width between observers. Dr. Garvin and two of her colleagues made cuts, or kerfs, in the bones prior. To determine how close the measurements in the cuts were, the technical error of measurement, or TEM, was calculated. First, the absolute TEM was calculated and from this relative TEM was obtained to get a percentage. Ideally, the percentage should be below 5%; however, the values obtained ranged from 14.63% to 17.01%. Then two equations were taken from literature to determine if the minimum kerf width could predict blade width. After obtaining the results and using the equation, comparisons were made with the expected blade width and the expected tooth width. The results for both were mixed. It was also analyzed whether either equation was better and if one of the observer's data closely aligned; however,

this was also inconclusive. Lastly, it was also determined whether the equations were more useful to predict hand saw blade width versus mechanical saws, but the results were again mixed. The significance of these studies is important to the field of forensic science because there is not a lot of research on dismemberment studies using saws. Having a way to accurately deduce what blade was used in an investigation would be extremely useful in a court case.

◆ 9 G ◆

Comparative analysis of the neuropil space in the Carnivora

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The Carnivora are a diverse group of primarily meat-eating mammals which include some 270 species. As a group, the behavioral repertoire of the Carnivora is complex with a wide range of hunting strategies as well as social behavior suggesting that this clade evolved unique neural machinery to support such complexity. In the present study we examined the neuropil space, a robust proxy for connectivity in the cerebral cortex (prefrontal, primary motor, and primary visual) of 10 Carnivora (coyote, domestic dog, red fox, fennec fox, African leopard, African lion, cheetah, snow leopard, domestic cat and Siberian tiger). Using design based stereological sampling and image analysis applied to histological sections, we quantified the neuropil fraction and compared this between species. These preliminary findings are interpreted within and evolutionary context and we present some postulates on the co-evolution of sociality and cortical gyrification within this group.

◆ 10 G ◆

Variables influencing minimum kerf width in dismemberment studies

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In medicolegal cases involving dismemberment, forensic anthropologists are tasked with providing information about the potential tool (e.g., saw) used, which may assist with investigations and prosecutions. When incomplete cuts are discovered in bone, the cut width (referred to as minimum kerf width – MKW) can be informative and publications have suggested that they can be used to predict saw blade width. Preliminary studies conducted at DMU have suggested there is too much error for such prediction equations to have utility in forensic cases. This study aims to better understand what factors may influence MKW, thereby impacting the accuracy of the blade prediction equations. Forty-eight incomplete cuts were made on fleshed anatomical limbs with three hand and five mechanical saws. MKWs were collected from these incomplete cuts using calipers. Statistical analyses were conducted to determine what effect saw power, tooth-per-inch (TPI), and blade set width have on MKW. On average, mechanically powered saws have significantly higher MKWs compared to hand saws, although results were variable. TPI was also a significant factor, even after accounting for blade set width. Higher TPI (meaning smaller teeth) resulted in MKWs more closely aligned with blade set width. Other variables, such as measurement modality, measurement location, measurement units, and rounding likely also contribute to MKW variation. Larger samples including more diverse hand and mechanical saws are required to parse out the effects of each of these variables, which can then be used to create more fine-tuned blade width prediction equations.

◆ 11 G ◆

Inter and intra reliability of orienting skull models

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The goal of our research is to examine inter- and intra-reliability of orienting CT-derived skull models to radiographic images. This is an important first step to examining the reliability and accuracy of frontal sinus identification method across image modalities (CTs vs radiographs). To accomplish this, we split the research into two phases. During Phase 1, we used *3DSlicer* to import a 3D model of a skull with a set of landmarks. We then manually oriented the skull model to match the appropriate landmarks according to a radiograph of the same individual. After orienting the same 30 individuals each, we used *ImageJ* to scale the paired images and get xy-coordinates of the distinct landmarks. During Phase 2, we repeated orienting skulls for 15 individuals and compared the *ImageJ* landmark data to get intra-reliability data. We also repeated this process for 15 individuals that were oriented by the other researcher to check inter-reliability. To ensure comparability of landmark sets, we used *Morpheus* to translate and scale (but not rotate) the landmark sets for each individual. The new landmarks were pasted in excel and the Euclidean distance between each landmark for intra- and inter-data for the two phases was obtained. Analysis resulted in a total error of 1.2% for intra-reliability and 1.5% for inter-reliability. These results suggest a high degree of repeatability in aligning the skull models within and across observers. Future analyses can be done to test for repeatability and if/how it affects actual identification processes using frontal sinus traits

◆ 12 G ◆

Frontal sinus morphology as a forensic identification method: a comparison of intra-observer scores between scout radiographs and 3D skull images

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In forensics, frontal sinus identification studies utilize antemortem and postmortem samples of the same imaging modality; in practice, this may not be available. The goal of this preliminary study is to assess whether basic frontal sinus features can be observed consistently across image modalities (CT vs radiograph). This study incorporates scout radiographs and translucent digital crania (rendered from CT scans) from two sources: postmortem individuals (with soft-tissue) from the New Mexico Decedent Image Database¹ (NMDID; n=30) and dried crania from the Smithsonian Institute (SI; n=20). First, sinus presence/absence (P/A) was established, with presence above the supraorbital line. If present, the following variables were recorded: P/A intersinus septum, P/A right/left sinus, and arcade number. McNemar tests on P/A data and Wilcoxon tests on count data indicate no significant differences between image modalities for either sample (all p-values >0.05). However, the SI sample had higher consistency for the inter-sinus septum than NMDID (SI $p=1.000$; NMDID $p=0.250$). This is likely a result of the presence of soft tissue in the NMDID sample. Sinus P/A for both samples performed with high agreement ($p=1.000$). Overall, results of this study indicate utilizing different image modalities should not alter assessments of basic frontal sinus morphology. However, presence of brain tissue may make some traits (e.g. intersinus septum) difficult to see. This study provides preliminary support for mixed-modality comparisons. Future research should be conducted on larger sample sizes and additional variables (e.g., intra-sinus septa) to assess how they are affected by changes in diverse image modalities.

◆ 13 G ◆

Stabilization of frontal sinus traits with age: forensic implications

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The frontal sinus has served to be a useful tool in positive forensic identifications, given that the frontal sinus and shape are unique to each individual when present. Methods of frontal sinus identification include visual comparisons and coding methods. These methods were produced and tested on adult samples, yet the applicability to subadult samples is unknown. This study aimed to assess at what age range frontal sinus variables that are used in these methods stabilize. A longitudinal sample of 1,273 radiographic images of males and females aged 5-29 years old were used in this study. Variables related to the right and left sinus presence, width, height, separation, scallops and supraorbital cells were scored on the full sinus as well as the supraorbital line. The average stabilization age for width, height, presence, separation, and inter-sinus septum ranged from 9-11 years old, which increased to 11-13 years if the supraorbital line was used as the lower border. Significant variation in age stabilization was observed for some variables e.g., the number of scallops stabilized at 6 years for one individual but 25 years for another. Intra-sinus septa stabilized around 13-14 years. Results suggest that the overall final morphology is not attained until after puberty. Subjectivity and scoring difficulty were also noted during the research, which could have significant implications if trait scores are being used to make

identifications. Care must be taken when comparing antemortem and postmortem sinus morphologies prior to 14 years of age, as significant growth and development may affect identifications.

◆ 14 G ◆

Exercise protects against inflammation by modulating rat hippocampal NF- κ B and nucleus accumbens FosB/ Δ FosB.

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It is well-established that exercise exerts beneficial effects on the central nervous system, such as protecting against neuronal aging and inducing stress-resilience. However, significant individual differences exist in exercise motivation, and the underlying mechanisms linking exercise to brain health remain unclear. Using rat voluntary wheel running, we modeled for acute exercise: rats were allowed to run during a 5-hour session after 4 days of training and subsequent 2 days of rest. They were then grouped based on running distances. With high throughput active kinome profiling on rat hippocampus, we discovered exercise significantly reduces the activity of several kinases in the NF- κ B activation pathway responsible for cellular inflammation, including COT, IKK, PKD, and RIPK. Subsequent validation with transcriptional analysis showed that with an acute bout of running, NF- κ B activity in the hippocampus is significantly repressed compared to sedentary controls, especially in high-running rats. Additionally, we found that acute exercise induces FosB/ Δ FosB expression in the nucleus accumbens, which drives motivation in reinforced behaviors. This is intriguing because while FosB/ Δ FosB canonically responds to repeated and chronic exposure to certain antidepressants or drugs of abuse, here we show that a single period of exercise is sufficient to induce its expression. In summary, we propose that acute exercise may exert anti-inflammatory effects via downregulation of NF- κ B pathway in the hippocampus, and the motivation underlying exercise may be related to FosB/ Δ FosB expression in the nucleus accumbens. Future directions include explicating individual differences in exercise motivation and examining other brain regions.

◆ 15 G ◆

Requirement of optimal calmodulin binding for cardiac beta-1 adrenergic receptor functions

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The β_1 -adrenoceptor (β_1 -AR) plays a critical role in cardiac functions by promoting both myocardial Ca^{2+} entry and sequestration thus facilitating both contraction and relaxation. In humans, Arg389 and Gly389 are common single nucleotide polymorphisms (SNPs) in β_1 AR with the Arg389 SNP being more prevalent in Chinese and African American populations. Arg389 is associated with increased cAMP production and response to β_1 AR agonists, and individuals with Arg389 allele respond better to β blockers. The mechanisms for these observations are entirely unknown. Calmodulin is the ubiquitous sensor that transduces Ca^{2+} signals to target protein activities and is a limiting factor in the heart due to its insufficient expression for its target proteins. We tested the hypothesis that β_1 AR directly interacts with calmodulin and that the Arg389 and Gly389 SNPs are associated with distinct β_1 AR-calmodulin interactions. Previous lab members identified a novel calmodulin-binding domain located at the juxtamembranous region of β_1 AR that encompasses the Arg/Gly389 SNP and revealed that β_1 AR-calmodulin interactions are Ca^{2+} -dependent, with higher Ca^{2+} sensitivity of the Arg389 β_1 AR-CaM interaction over the entire physiological Ca^{2+} range and (Bloomfield, 2019). Using a novel imaging developed for β_1 AR we show here that the Arg389 SNP is associated with increased Ca^{2+} response to β_1 AR agonist while either increased CaM-binding mutant (F387A/R389/R396Q β_1 AR) or decreased CaM binding mutant (G389- β_1 AR) is associated with reduced Ca^{2+} response. These results suggest that optimal calmodulin binding is required for β_1 AR function and help explain the different responses in subjects carrying the Arg389 vs the Gly389 SNP.

Olive: a super fruit for cervical cancer

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Cervical cancer (CC) is the most common cancer of the genitourinary system worldwide. Due to the severe side effects from surgery and radiation chemotherapy, treatment with minimal side effects is needed urgently. Olives are widely consumed fruits and it has been shown that the polyphenols in olive extract (OE) inhibit growth of lung, pancreatic, and colon cancers. However, little is known about its effect on CC. This study was designed to investigate if olive has any direct effect on the growth of CC and explore its potential molecular mechanisms. Clonogenic survival assay, cell proliferation, and caspase-3 activity kits were used to evaluate the direct effects of OE on cell survival, proliferation, and apoptosis of the widely-studied CC cell line SiHa. We further investigated possible molecular mechanisms using RT-PCR. The percentage of colonies of SiHa CC cells decreased significantly when treated with OE. This was paralleled with the decrease in the OD value of CC cells when treated with OE. Furthermore, the relative caspase-3 activity in CC cells increased significantly in the presence of OE. The anti-tumor effect of OE on SiHa CC cells correlated with decreased levels of the pro-proliferative molecule cyclin E. The pro-apoptotic effect of OE correlated with increased levels of the pro-apoptotic molecules Fas and TRAIL. Olive inhibits SiHa CC cells by the inhibition of proliferation and promotion of apoptosis via the modulation of cyclin E, Fas, and TRAIL. Such a study might be helpful to develop new treatment for cervical cancer.

Evaluation of DMD Expression in Pediatric Duchenne Muscular Dystrophy Patients

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Duchenne Muscular Dystrophy (DMD) is an X-linked disorder that alters the function of dystrophin. Dystrophin belongs to a protein complex responsible for holding skeletal and cardiac muscle fibers together during contraction and relaxation. When this protein is damaged, its concentration decreases within the muscle fibers and they begin to degenerate. We hypothesized that the degenerative nature of the disease would correlate with a gradual decrease in the expression of the *DMD* gene (the gene for dystrophin) in muscle fibers from human patients. Through the R2 genetic platform, we selected a set of muscle biopsies from patients with DMD (n=22) and healthy controls (n=14) and analyzed the expression pattern of *DMD* between the two groups as well as between different age groups (0-12 months and 13+ months). We used the Student T-Test to evaluate whether there was a significant difference ($P \leq 0.05$) in the Log2 of *DMD* expression. Our results revealed significant downregulation of the *DMD* gene in muscle fibers from patients with DMD when compared to healthy controls ($P \leq 0.05$). However, our analysis revealed no difference in the expression of *DMD* between patients younger and older than one year old. We concluded that changes in the expression of *DMD* are likely congenital yet remain slightly degenerative past the one-year mark, when many children are expected to begin meeting many of their first gross motor skill milestones.

Chronic pain state mediates development of hippocampal and renal inflammatory responses

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Chronic pain and related stress have been previously linked to the development of mood disorders and dysfunction of peripheral organs such as the kidney. While the underlying neurophysiological mechanisms remain elusive, here we

examined the effects of chronic pain on activation of immune-inflammatory responses in the brain and kidney. Male rats were exposed to chronic inflammatory pain for up to 42 days [multiple injections of Freund's adjuvant (CFA) into the hind paw], which produced a state of chronic allodynia and enhanced behavioral emotionality. Biochemical analysis of the hippocampus, a limbic region that regulates mood and stress responses, showed that CFA evoked increases in expression of ionized calcium binding adaptor molecule 1 (IBA1) and NLRP3 inflammasome proteins, known markers of microglial activation and neuroinflammatory responses, respectively. An increase in the neutrophil gelatinase-associated lipocalin (NGAL) and IL-18 are recognized as early diagnostic injury and inflammatory biomarkers of kidney disease. NLRP3 is implicated in the pathogenesis of kidney diseases by regulation of renal inflammation. Analysis via immunocytochemistry demonstrated that CFA also evoked significant increases in NGAL, IL-18 and NLRP3 protein levels in the renal glomeruli and tubules, suggesting that chronic pain and related stress effects induce renal inflammation and possibly a reduction in kidney function. Together, these findings provide new evidence to support a mechanistical understanding of a bidirectional relationship between chronic pain-related stress and kidney dysfunction. Further understanding of this relationship could contribute to the identification of novel treatment strategies to diminish both mental health and renal physiological consequences of chronic pain.

◆ 19 G ◆

Obesity exacerbates renal injury in a model of ovarian hormone deficiency

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Obesity accounts for ~25% of kidney diseases observed in women; however, its effects on kidney function have not been defined in post-menopausal women. In an ovarian hormone deficiency model (ovariectomized animals), we measured a significant weight gain compared with sham-operated control, associated with perirenal adipose tissue accumulation, and an increase in **1.** glomerular filtration rate (GFR) used to determine renal function, **2.** protein level of the NGAL, an early biomarker of kidney injury and **3.** intrarenal lipid accumulation found in the renal tubules. In this study, we aim to demonstrate whether obesity affects the levels of renal injury measured in the model of ovarian hormone deficiency. We studied four groups of mice: the first and second groups underwent ovariectomy (OVX); group one was fed on a high-fat (HF) diet, and group two was on a low-fat (LH) diet. The third and fourth groups as control underwent surgery without ovariectomy (SHAM); they were fed with HF or LF diet, respectively. Significant increase in body weight was measured in mice on HF compared to LF diet. NGAL protein levels were increased significantly in OVX mice when compared to SHAM control in mice on both HF and LF diet. Furthermore, mice on HF diet had significant higher NGAL levels in OVX and sham-control conditions than mice in the same conditions on LF diet. These findings indicate that weight gain exacerbates renal injury induced by OVX. They support the understanding of the mechanisms implicated in the development of kidney diseases in obese post-menopausal women.

◆ 20 G ◆

Investigating the role of the cytosolic branched chain aminotransferase (BCATc) as a therapeutic target for anti-lymphoma T cell immunity

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Cancer of the lymphatic system is described as lymphoma. The lymphoma microenvironment is a complex network between malignant and nonmalignant cells. Being a part of the nonmalignant population, T lymphocytes are often exhausted in the lymphoma microenvironment. Metabolic enzymes, such as the cytosolic branched chain aminotransferase (BCATc) are considered immunosuppressive. BCATc acts as a negative regulator of T cell activation limiting T cells' ability to function properly. We hypothesized that if the BCATc gene is deleted from T cells, they will become better armed in eradicating lymphoma. By using a newly designed mouse model with BCATc deleted from T cells (T-BCATcKO mice), we performed tumor studies where male and female mice were injected with murine lymphoma (EL-4) cells followed by monitoring of tumor growth, body, organ weights, and food intake for 15 days. Our results showed that T-BCATcKO mice were tumor free until day 9 compared to control mice (tumor free until day 7). Female and male mice

from the T-BCATcKO colony showed significant delay in tumor development but the tumor masses, although reduced by 25%, were not statistically different from those of control mice at the end of the study. None of the animals differed in body, organ weights or food intake. Ongoing experiments are tuned toward therapeutic application of this research. We aim to decipher how the loss of BCATc affects different T cell populations in spleens and tumors isolated from T-BCATcKO mice and better understand the impact BCATc has on the T cell ability to fight lymphoma.

◆ 21 G ◆

The *BCKDH-E2 (DBT)* gene is a putative novel target of the c-Myc oncogene in T cell lymphoma

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T-cell lymphoma accounts for 10% of Non-Hodgkin's lymphomas (NHLs), a complex group of blood malignancies. Understanding these cancers' metabolism is essential to elucidate potential drug targets. The oncogene c-Myc, which is commonly overexpressed in lymphomas, acts as a transcription factor that regulates pathways driving nucleic acid, lipid, and protein metabolism critical for proliferation. Bioinformatic analyses suggest that genes encoding enzymes in the metabolism of the branched chain amino acids (BCAAs) are putative targets of c-Myc. One of these enzymes is the E2 component of the branched-chain alpha-keto acid dehydrogenase (BCKDH) complex and encoded by the *DBT* gene. BCKDH-E2 is an alias for dihydrolipoamide branched chain transacylase and comprises the core of the BCKDH complex. After bioinformatic analysis, we hypothesized that c-Myc binds the *DBT* promoter region, activating *DBT* expression in lymphoma cells. To test this hypothesis, the *DBT* promoter was isolated from mouse T cell lymphoma DNA and cloned into pCR Blunt II-TOPO vector followed by isolation of *E.coli* transformants that contained pDBT-TOPO plasmids. Positive transformants were sequenced and subjected to a second cloning into the pGL4.10 luciferase vector to create the pDBT-luc plasmid. pDBT-luc was introduced into mouse T-cell lymphoma cells, treated with the c-Myc inhibitor 10058-F4 for 24h, then followed by measurement of luciferase activity. Results showed that luciferase activity of pDBT-luc was significantly reduced by 10058-F4 suggesting that DBT was activated by c-Myc in malignant T cells. This is consistent with a finding that T-cell lymphoma patients with high expression of *DBT* have poor prognosis of survival.

◆ 22 G ◆

Topical single inhibition of PI3K or mTOR pathways in mice with low-grade anal dysplasia

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Anal dysplasia and anal cancer are increasing in incidence. Current therapies for anal dysplasia are invasive, non-specific to diseased tissue and associated with high recurrence rates. The purpose of this study is to determine if topical treatment with a single PI3K or mTOR inhibitor can halt the progression of low-grade anal dysplasia to anal cancer in an HPV mouse model. *K14-E6/E7* transgenic mice expressing HPV16 oncoproteins in their epithelium were randomized into six treatments groups (≥30 mice per group). Mice began daily topical treatments at the anus after developing low-grade anal dysplasia. Treatment groups included control/no treatment, topical carcinogen (7,12-Dimethylbenz[a]anthracene (DMBA)), topical Pictilisib (0.5%) (PI3K inhibitor), with or without DMBA, and topical Sapanisertib (1%) (mTOR inhibitor), with or without DMBA. After 20 weeks of treatment, tissues were immunohistochemically stained for cell signal pathway markers, imaged, analyzed using ImageJ and compared via one-way ANOVA. All mice treatment groups without DMBA had no microscopic anal cancer, while 97% (31/32) of DMBA only mice had cancer after 20 weeks. For mice given Pictilisib with DMBA and Sapanisertib with DMBA, 93% (28/30) and 97% (30/31) developed microscopic cancer, respectively. Mouse tissues treated with Pictilisib with or without DMBA displayed a decrease in pAKT (PI3K signaling) compared to control (p-value<0.05) and DMBA only (p-value<0.05). Tissues treated with Sapanisertib with DMBA displayed a decrease in pS6 (mTOR signaling) as compared to control only (p-value<0.05). Topical treatments with a single PI3K or mTOR pathway inhibitor may delay the onset of overt anal tumors, but do not prevent anal carcinogenesis in mice with established low-grade anal dysplasia.

Screening and validation of FDA approved oncology drugs for induction of progesterone receptor expression in endometrial cancer cells

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Endometrial cancer (EC) is the most predominant uterine cancer and continues to grow in incidence and deaths annually. A characteristic of malignant endometrial tumors is sensitivity to growth promoting effects of estrogen and growth limiting effects of progesterone. Progesterone hormonal therapy is typically used in EC treatment; however, it is not lasting in efficacy due to the downregulation of progesterone receptor (PR) expression in cancer cells. This investigation pursues the screening and validation of existing FDA-approved anticancer drugs which induce PR and mCherry, an endogenous PR reporter gene which faithfully reflects PR expression in endometrial cancer cells in real time.

CRISPR-9 created Ishikawa and ECC1 EC cells transfected with PR reporter gene attached to mCherry, confirmed via PCR. Western blot and qPCR analyses probing for mCherry and Romidepsin to visualize PR effect yielded eight possible gene clones to use on drug-specific experimentation. A series of HTS experiments tested four clones from each cell line and compared 2000 to 4000 ECC1 cells using 100nM Romidepsin, the three most promising clones of each cell line in a dose-response format using Romidepsin, and EM18S and I12L on two separate plates treated with FDA-approved oncology drug plates to identify PR-inducing drugs. A proliferation assay of discovered drugs—Ixazomib, Venetoclax, Sunitinib, Vinblastine, Bortezomib, Panobinostat, Belinostat, and Carfilzomib—identified maximum doses for validation testing. qPCR and western blot analyses of valuable proteins validated relevant functions of identified drugs. Further experimentation is indicated to validate therapeutic efficacy of identified drugs and discover other drug therapy options.

Effects of chronic intermittent hypoxia on renal cortical antioxidant and pro-fibrotic signaling in chronic heart failure

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Sleep Apnea (SA) is a common comorbidity in patients suffering from congestive heart failure (CHF), and is independently associated with renal dysfunction. Chronic intermittent hypoxia (CIH, a model of SA) is associated with autonomic dysfunction, abnormal renal hemodynamics, oxidative stress, and inflammation. The combination of these insults may underlie renal dysfunction in CHF patients with SA. This study sought to evaluate the role of CIH in promoting renal dysfunction in CHF. We hypothesized that oxidative, inflammatory, and pro-fibrotic signaling would be increased in kidneys of CHF rats, that this would be exacerbated by CIH, and that carotid body denervation (CBD) would have a salutary effect. Adult male Sprague Dawley rats (n=7-12/group) were randomly assigned to sham, CHF, CHF-CIH, and CHF-CIH-CBD groups. CHF was induced by ligation of the LAD coronary artery (CAL) and CBD was performed 4 weeks post-CAL. Renal cortical tissue was assessed for mRNA expression using qRT-PCR. Data was analyzed using a single factor ANOVA or non-parametric test when appropriate. Expression of eNOS and NQO1 mRNA were significantly decreased (p<0.05) from sham in CHF, but not different between CHF and CHF-CIH or CHF-CIH and CHF-CIH-CBD (p>0.05). Fibronectin mRNA expression was not significantly different between sham and CHF but was significantly greater in CHF-CIH than CHF (p<0.05) and was significantly reduced by CBD (p<0.05). CIH may promote fibrosis in renal tissue of CHF animals by mechanisms related to downregulation of antioxidant defenses. Whether or not CBD can effectively attenuate tissue damage in these conditions requires further study.

Neuronal nAChRs may exhibit subunit quantitative or functional change during withdrawal from an alcohol use disorder

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The misuse of alcohol with additional substances, particularly nicotine, is established across a wide demographic. The strong co-morbidity between nicotine and alcohol misuse potentially indicates a complex, interconnected change in neural physiology. This intricate interaction may indicate why a significant number of alcohol-dependent individuals smoke cigarettes and why daily smokers have a greater risk of relapse to alcohol misuse. An interconnected physiological pathway may suggest overlapping therapeutic targets for those suffering from alcohol withdrawal and nicotine use. Nicotine primarily acts through the nicotinic acetylcholine receptors (nAChRs). Alcohol is an indirect agonist to nAChRs that alters the mesolimbic dopaminergic system by modulating acetylcholine release and increasing dopamine release. Repeated cycles (4 on/3 off) of 12 consecutive hours of ethanol vapor exposure were conducted over three weeks. Following the last exposure, animals entered forced withdrawal for > 35 days. Animals were then killed, their brains removed and regions (basolateral amygdala, hippocampus, nucleus accumbens, and prefrontal cortex) implicated in the disease process of substance use withdrawal were dissected and stored at -80°C. nAChR subunit expression for $\alpha 4\beta 2$ and $\alpha 7$ receptors will be analyzed via western blot to characterize protein expression patterns between withdrawn animals and ethanol-free control animals. Future work will include studies utilizing whole patch clamp electrophysiology to isolate and quantify subunit/receptor specific contributions to synaptic function under withdrawal and control conditions.

Purifying 4- α -glucanotransferases from *T. vaginalis*

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Trichomonas vaginalis is the parasitic protist responsible for the sexually transmitted infection, trichomoniasis. Our interest in the parasite lies in its accumulation of glycogen, a branched polymer of glucose that is stored and metabolized for energy during times of extracellular glucose depletion. By studying this, we may be able to uncover how to interrupt the life cycle of the parasite and formulate new methods of treatment for an infection. The genome of *T. vaginalis* has the capacity to encode enzymes known as 4- α -glucanotransferases. These enzymes are used to facilitate the breakdown of glycogen/starch. However, their role in *T. vaginalis* remains undefined. We have found that three separate genes for 4- α -glucanotransferases each contain an N-terminal glycogen binding domain. These provide us with a unique area of focus for our project. We used two 4- α -glucanotransferases, TVAG 191140 and TVAG 226870. We began by amplifying their DNA sequences from *T. vaginalis* genomic DNA and then cloning these into the bacterial expression vector pET-51b, which adds a C-terminal histidine tag to facilitate recombinant protein purification. After the cloning procedure, the samples were transformed into Origami (DE3) competent *E. coli* cells for protein expression. The next step was to purify the 4- α -glucanotransferases using Immobilized Metal Ion Affinity Chromatography (IMAC). Future studies will likely involve assessing enzymatic activity of the proteins by thin layer chromatography, and determination of glycogen binding using affinity gel electrophoresis. Ultimately, this will allow us to determine the function of the unique glycogen binding domain of 4- α -glucanotransferases in *T. vaginalis*.

SARS-CoV-2 spike protein inhibits growth of prostate cancer: a potential role of the COVID-19 vaccine killing two birds with one stone

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SARS-CoV-2 vaccines induce antibody-mediated immune responses by introducing spike protein to the host. The long-term safety and efficacy of these vaccines continue to be studied. Patients with cancer are a particularly vulnerable population with regards to infection susceptibility, severity of the disease, and immune response to infection and/or vaccination. Prostate cancer is estimated to be the leading cause of new cancer cases among U.S. males in 2021 and is also estimated to have the 2nd highest mortality rate. This study investigates the effects that isolated SARS-CoV-2 spike protein has on LNCaP prostate cancer cell survival. The effects of SARS-CoV-2 spike protein on LNCaP prostate cancer cell survival were assessed using clonogenic cell survival assay, quick cell proliferation assay, and caspase-3 activity kits. RT-PCR and immunohistochemistry (IHC) were performed to investigate underlying molecular mechanisms. SARS-CoV-2 spike protein was found to inhibit prostate cancer cell proliferation and promote apoptosis. Anti-proliferative effects were associated with downregulation of the pro-proliferative molecule CDK4. The increased rate of apoptosis was associated with upregulation of pro-apoptotic molecule FasL. SARS-CoV-2 spike protein inhibits the growth of LNCaP prostate cancer cells in vitro by a two-pronged approach of downregulating CDK4 expression and upregulating FasL. The introduction of SARS-CoV-2 spike protein into the body via COVID-19 vaccination may have the potential to inhibit prostate cancer in patients. This potential beneficial association between COVID-19 vaccines and prostate cancer inhibition suggests intriguing prospects for vaccination and cancer treatment alike but will require more extensive studies before any conclusions can be drawn.

◆ 28 F ◆

Genomic screening affirms cytoskeletal destabilization as mechanism for boric acid toxicity in the pathogenic yeast *Candida albicans*

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The dimorphic yeast *Candida albicans* is a common human pathogen causing disorders ranging from superficial colonization of mucosae to life-threatening disseminated infections. The virulence of the organism is based on its ability to undergo sweeping metabolic and morphological changes that help the fungus survive and even thrive within the human host. The broad-spectrum antiseptic Boric Acid (BA) has shown remarkable effectiveness for topical treatments of superficial yeast infections. Previous work has shown that BA destabilizes the cytoskeleton and inhibits filamentous growth, compromising the fungus' ability to establish tissue infections through the formation of invasive hyphae. It was also shown that BA inhibits mitochondrial function even at low doses, suggesting that BA forces a metabolic shunt of pyruvate into the cytosolic pathways of ethanol and fatty acid synthesis. In the present study, we present the results of a genomic screen that was undertaken to weigh the relative contributions of metabolic and morphological effects to the antifungal activity of BA. A screening of 2372 conditional yeast deletion mutants, representing roughly 40% of the genome, allowed the isolation of 172 strains that showed BA sensitivity in liquid and on solid media. A gene ontology analysis of the BA-sensitive strain set showed that mutations affecting assembly and dynamics of the actin cytoskeleton are by far the most common cause for BA sensitivity, while mutations in fatty acid metabolism have no bearing on BA resistance. It is concluded that polarized actin is the prime target for the antifungal activity of BA against dimorphic yeast.

◆ 29 G ◆

Purification of an α -galactosidase from *Trichomonas vaginalis*

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Trichomonas vaginalis is a protozoan parasite, and the causative agent of trichomoniasis, the most common non-viral sexually transmitted infection. During growth, *T. vaginalis* accumulates large stores of glycogen, which serves as a source of both carbon and energy. We hypothesize that this glycogen is a crucial resource for the parasite during periods of low nutrient availability, such as during transmission between hosts. Our lab has previously evaluated glycogen regulation in this parasite and have determined that glycogen storage is likely being driven by extracellular glucose concentration. Thus, our aim is to further characterize enzymes involved in breaking down available carbohydrate sources to better understand the carbohydrate metabolism of *T. vaginalis*, with the hope that this information may lead to novel targets for anti-trichomonal chemotherapy. In addition to glucose, previous work in our lab has demonstrated that galactose can also support the growth of *T. vaginalis*. The open reading frame TVAG_145340 encodes for a putative α -galactosidase that may allow the parasite to metabolize compounds that contain galactose. Here we express, purify, and begin to characterize the TVAG_145340 open reading frame in *E. coli*. After successful purification, we were able to show

enzymatic activity toward an α -galactosidase substrate, PNPG at a pH level of 4. In addition, we looked at the possibility of metallic cofactors aiding in optimal enzymatic conditions, with results suggesting that manganese may play a role in this α -galactosidase functionality.

◆ 30 G ◆

The effect of G1 pretreatment on LPS-induced MAPK activity

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Estrogen influences inflammatory responses through a variety of both pro-inflammatory and anti-inflammatory mechanisms. There are three known estrogen receptors including, the nuclear hormone receptors ER α and ER β , and the G protein-coupled estrogen receptor (GPER). Macrophages play important roles in both adaptive and innate immunity by engulfing target cells, producing proinflammatory and anti-inflammatory cytokines, and presenting antigens to T cells. While all three estrogen receptors are expressed in macrophages, little is understood about the role of GPER in this cell type. Previous work in our laboratory demonstrated that GPER activation by the agonist G-1 reduced lipopolysaccharide (LPS)-induced proinflammatory cytokine production in the murine macrophage cell line RAW 264.7. p38 MAPK is an important regulator of LPS-induced inflammatory cytokine production. Thus, we hypothesized that G-1 inhibits proinflammatory cytokine production by inhibiting p38 activity. To test this hypothesis, we pre-treated RAW cells with either 100 nM G-1 or the vehicle (DMSO) for 24 hours prior to stimulating cells with 100 ng/ml LPS. Immunoblot analysis of the phosphorylation of p38 indicates that G-1 increases LPS-induced p38 activation by approximately 5-fold. We repeated the same experiment in bone marrow derived macrophages and observed the same findings. While p38 is an important pro-inflammatory signaling molecule, other signaling molecules including NF-kappa B and JNK regulate LPS-induced pro-inflammatory cytokine production. Studies are underway to determine how G-1 modulates these molecules to potentially explain how G-1 can inhibit pro-inflammatory cytokine production while increasing p38 activity.

◆ 31 G ◆

Regulation of lysosomal calcium dynamics by chloroquine

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Mucopolipidosis type IV (MLIV) is an autosomal recessive inherited disease that is characterized by delayed development and gradual vision impairment. Currently, no specific therapy exists for MLIV. MLIV is caused by mutations in the MCOLN1 gene, which encodes the lysosomal Ca²⁺ channel *Transient Receptor Potential Mucolipin 1* (TRPML1), the main channel that mediates Ca²⁺ extrusion from lysosomes into the cytosol. Lysosomes take up Ca²⁺ released from the endoplasmic reticulum (ER), a process that is important for intracellular Ca²⁺ dynamics and regulation of lysosomal functions. In MLIV, the mutations in MCOLN1 cause lysosomes to be over-acidified, which is associated with aberrant lipidosis. Chloroquine is a weak base that can enter the acidic lysosome. However, it is unclear if and how chloroquine affects lysosomal/ER Ca²⁺ dynamics. We show here that chloroquine reduces lysosomal acidity and triggers intracellular Ca²⁺ signals that are inhibited by pretreatment with the specific TRPML1 inhibitor ML-SI1, indicating that chloroquine triggers lysosomal Ca²⁺ release via TRPML1. Interestingly, pretreatment with 2-APB, an inhibitor of IP₃ receptors, the key ER Ca²⁺ release mechanism, dose-dependently enhances the chloroquine-induced Ca²⁺ signals both in the presence and absence of extracellular Ca²⁺. Treatment with 2-APB alone does not trigger any Ca²⁺ signals in cells. These data indicate that chloroquine alkalinizes lysosomes and stimulates TRPML1-mediated Ca²⁺ extrusion from lysosomes. The data also suggest the existence of a mechanism that mediates ER uptake of Ca²⁺ released from lysosomes. These effects of chloroquine and related mechanisms may be relevant in the search of treatment for patients with MLIV.

◆ 32 G ◆

The role of SARS-CoV-2 spike protein in growth of cervical cancer: a possible encouraging link between COVID-19 vaccines and cancer

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Recently developed vaccines for the SARS-CoV-2 virus utilize endogenous production of the virus' spike protein (SP), allowing the host to develop an immune response. As a result of the novelty of this virus and its vaccines, little is known overall about the potential effects of the SP on the pathogenesis of neoplasia, either from vaccination or from infection. Furthermore, cervical cancer is the most common cancer of the female reproductive system and the 4th most common cancer in females worldwide. This study was designed to investigate if SARS-CoV-2 SP has any direct effect on SiHa cervical cancer cells. The effects of SARS-CoV-2 SP on cervical cancer cell proliferation and apoptosis were investigated by using clonogenic cell survival assay, quick cell proliferation assay, and caspase-3 activity kits in a widely used cervical cancer cell line, SiHa. RT-PCR and immunohistochemistry were also performed to determine the potential molecular mechanisms. The growth and proliferation of SiHa cancer cells were inhibited by SARS-CoV-2 SP. SARS-CoV-2 SP also induced apoptosis in SiHa cancer cells. The anti-proliferative effect of SARS-CoV-2 SP on SiHa cancer cells was associated with the upregulation of the anti-proliferative molecule p53. The pro-apoptotic effect of SARS-CoV-2 SP on SiHa cells was associated with the upregulation of the pro-apoptotic molecule TRAIL. SARS-CoV-2 SP inhibits the growth of cervical cancer via upregulation of p53 and TRAIL. This may suggest a possible encouraging association between COVID-19 vaccines and cancer. Further studies are needed to elaborate on the potential effects of the SARS-CoV-2 SP on other forms of cancer.

◆ 33 G ◆

Biphasic effect of leptin treatment on free fatty acid accumulation in renal tubule cells

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Chronic kidney disease (CKD) is common among adults in US; more than 1 in 7 are estimated to have CKD. Leptin, an adipose-derived hormone, is elevated (hyperleptinemia) in the plasma of CKD patients and hyperleptinemia plays an essential role in the pathogenesis of CKD. In physiological condition, the kidney clears leptin from circulation through combination of filtration at the glomeruli and metabolic degradation in renal tubules. Therefore, hyperleptinemia in CKD could be mediated by combination of decreased renal clearance and tubular uptake of total serum leptin. Disturbances of intrarenal lipid accumulation are proposed to contribute to renal injury and dysfunction (lipid nephrotoxicity) in CKD. However, a role of hyperleptinemia in intrarenal lipid accumulation has not been investigated. In this study, we determined the action of leptin on free fatty acid (FFA) accumulation in renal tubule cells. Cells were incubated with a mixture of albumin-bound oleate and palmitate (molar ratio 2:1) and stained with Oil Red O to visualize FFA. FFA uptake was quantified in vehicle or leptin treated cells. Our data demonstrated a leptin concentration-dependent (0.05 µg/ml and 0.5 µg/ml) reduction of FFA uptake in cells with or without leptin pre-incubation prior exposure to FFA. Leptin effect on FFA uptake was reversed by high concentration of leptin (5.0 µg/ml). In summary, leptin decreased FFA accumulation at < 0.5 µg/ml and increased it at > 0.5 µg/ml. These findings suggest a biphasic effect of leptin on FFA accumulation and aid the understanding of how renal levels of leptin affect lipid nephrotoxicity.

◆ 34 F ◆

Increased NMDA receptor function during protracted withdrawal from chronic intermittent ethanol exposure

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Functional dysregulation of the glutamate system during withdrawal from chronic drug exposure is a primary driver of drug craving and relapse. Animal models of psychostimulant use have demonstrated dynamic NMDA receptor function and expression that contribute to drug seeking behavior. These changes begin as early as 5 days into abstinence and are persistently expressed into long term withdrawal (>60d). Evidence of NMDA receptor dependent changes during short term withdrawal (24h) suggest that similar mechanisms may drive drug craving and relapse behaviors following chronic exposure to ethanol. To this end, we investigated NMDA receptor mediated synaptic function during protracted withdrawal 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 (24h) withdrawal

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from CIE (10d, 12hr/day) and regulates anxiety like behavior expressed during withdrawal. Adolescent rats were exposed to repeated cycles of CIE (12hr/day, 4d on/3d off, 3 cycles). Male rats demonstrated increased functional contributions of NMDA receptors containing GluN2B and/or GluN3 in comparison to animals exposed to room air (CON) after >35days of withdrawal. Female rats demonstrated no change in NMDA receptor mediated function at similar time points. Results in males mirror cocaine self-administration data suggesting a possible common mechanism underlying aberrant synaptic function during withdrawal. Further characterization of females is ongoing to determine mechanisms of resilience or time dependency in this population.

◆ 35 G ◆

Leptin activated cardio-regulatory neurons in the central nervous system

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Hypertension is common among adults in America. As we age, the prevalence of hypertension begins to disproportionately impact women. In fact, 75% of women older than 51 years of age have hypertension. The central nervous system plays a significant role in regulating blood pressure. Two locales of interest are the paraventricular nucleus (PVN) and the rostral ventrolateral medulla (RVLM). The aim of this study is to determine if the adipocyte derived hormone leptin, which has been suggested to play a role in regulating blood pressure, activate neurons in the PVN and the RVLM. We propose that if activation occurs, leptin could be regulating cardio-regulatory neurons in these locals to augment blood pressure. Aged (47 – 50 weeks old) GFP leptin receptor tagged female mice were administered intraperitoneal injections of saline (0.1mL/g) or leptin (1mg/ml). Thirty minutes after injection, animals were perfused with 0.1M PBS and 4% paraformaldehyde. Brains were extracted and prepared for histological staining. Cfos labeling, indicator for neuronal activation, demonstrated that leptin increased the expression of cfos in the PVN and RVLM of the female animals. We also observed that the neuronal activation where on neurons that were positively labeled with leptin receptors. To further delineate the phenotype of the neurons that were activated by leptin, we stained for tyrosine hydroxylase. We observed that leptin receptors were located on tyrosine hydroxylase positive neurons. Supporting a pathway leptin uses to augments blood pressure in elderly women. Supported by The Iowa Osteopathic Educational Research Foundation and the Mentored Student Research Program

◆ 36 G ◆

Identifying novel mechanisms in which estrogen regulates blood pressure

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Cardiovascular disease is the leading cause of death among American women. Hypertension is a major risk factor for cardiovascular disease and its prevalence increases during post-menopause when estrogen levels are depleted. The mechanism by which the prevalence of hypertension increases after menopause is not well understood. Estrogen is considered cardioprotective before a woman reaches menopause. A better understanding of how estrogen provides a protective role against hypertension can lead to identification of novel therapeutic targets to improve post-menopausal hypertension control and treatment. Thus, we tested the hypothesis that estrogen can mitigate hypertension in part by inhibiting the activity of the adipocyte derived hormone leptin. Studies have reported that there is a direct correlation between leptin levels and post-menopausal hypertension. In this study, we tested the hypothesis that estrogen could attenuate leptin's signaling and ultimately its effect on blood pressure by increasing the translocation of suppressor cytokine signaling 3 (SOCS3) from the nucleus into the cytoplasm. SOCS3 acts to turn off leptin signaling. In this study, aged 52-week-old female C57BL/6 mice were administered an intraperitoneal injection of either sterile saline (0.1mL/g of body weight) or estradiol (1mg/g). Thirty minutes after the injection, the hypothalamus was removed, and subcellular fractionation of the cytoplasm and nucleus were collected. We observed that estradiol significantly increased SOCS3 expression in the cytoplasm. These data suggest that estrogen can attenuate the signaling of leptin by increase the release of SOCS3. Supported by The Iowa Osteopathic Educational Research Foundation and the Mentored Student Research Program.

Estradiol activates neurons in the paraventricular nucleus of aged ovariectomized mice

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It is established that hypertension is a significant contributor to cardiovascular disease in the world. When comparing hypertension rates, the prevalence of hypertension is higher in men compared to women. However, when comparing those 60 years and older, the incidence of high blood pressure among postmenopausal females become higher than males. Studies have suggested that the increase in the incidence of hypertension during post menopause is due to the depletion in the levels of circulating hormones, specifically estrogen. The exact mechanisms as to how estrogen decreases blood pressure has not been fully elucidated. However, it has been shown that estrogen can regulate neurons in the central nervous system to decrease blood pressure. In this study, we tested the hypothesis that estrogen regulates blood pressure in part by activating neurons located in the paraventricular nucleus (PVN); a locale in the brain that is important for central cardiovascular control. To test the hypothesis, aged (52 weeks old) ovariectomized (i.e. estrogen deficient) C57/B6 female mice were administered intraperitoneal injections of saline (0.1mL/g) or estradiol (1mg/ml). Thirty minutes after injection, animals were perfused with 0.1M PBS and 4% paraformaldehyde. Brains were extracted and prepared for histological staining. Cfos labeling, indicator for neuronal activation, was observed in the PVN of estradiol treated animals. This observation demonstrates that estrogen can regulate cardio-regulatory neurons located in the PVN. Future studies will delineate the phenotype of neurons within the PVN that estradiol is activating. Supported by the Iowa Osteopathic Educational Research Foundation and the Mentored Student Research Program.

◆ 38 G ◆

SARS-CoV-2 spike protein influences expression of ICAM-2 and ICOSL in prostate cancer cells

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SARS-CoV-2 is the novel coronavirus responsible for the COVID-19 pandemic. The viral protein of SARS-CoV-2, spike protein (SP), facilitates entry into host cells, contributing to pathogenesis of COVID-19. Prostate cancer is the most common cancer among men in the United States. ICAM-2 and ICOSL are expressed in cancer cells and their roles in cancer growth remain controversial. Nothing is known if SP could affect the expression of ICAM-2 or ICOSL. This study investigated the effects of SARS-CoV-2 SP on the expression of ICAM-2 and ICOSL in prostate cancer cells. The effect of SARS-CoV-2 SP on the survival of a widely used prostate cancer cell line, LNCaP, was assessed using clonogenic cell survival assay and quick cell proliferation assay. RT-PCR and immunohistochemistry (IHC) were performed to investigate the expression of ICAM-2 and ICOSL. A significant decrease in the percentage of colonies in LNCaP cells treated with SP was found, which was paralleled by a decrease in OD value in LNCaP cells in the presence of SP. In addition, the mRNA expression of ICAM-2 was lower, whereas the mRNA expression of ICOSL was higher in SP-treated LNCaP cells. This was supported by protein expressions for ICAM-2 and ICOSL evaluated with IHC. SARS-CoV-2 SP inhibits growth of prostate cancer. SARS-CoV-2 SP downregulates the expression of ICAM-2 but upregulates the expression of ICOSL. Further studies are needed to fully address the roles of ICAM-2 and ICOSL in the inhibition prostate cancer growth by SARS-CoV-2 SP.

◆ 39 G ◆

Mangosteen, the queen of fruits, constrains growth of melanoma

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Melanoma causes the most deaths out of all forms of skin cancer. The high number of deaths calls for research to uncover additional therapies to decrease the growth of melanoma. Mangosteen, often called “The Queen of Fruits”, is a tropical fruit with very sweet and sour flavor. Mangosteen has been shown to have an anticancer effect. However, little is known about its effect on growth of melanoma. The purpose of this study was to investigate the effect of mangosteen on growth of melanoma and its possible molecular mechanisms. The effects of mangosteen extract (ME) on survival, proliferation and apoptosis of CRL-11147 melanoma cell line were investigated by using clonogenic survival assay, cell proliferation kit, and caspase-3 activity kits. In addition, RT-PCR and immunohistochemistry were used to explore the possible molecular mechanisms. The percentage of colonies of melanoma cells decreased significantly in the presence of ME. This was consistent with the decrease in the OD value of melanoma in the presence of ME. The relative caspase-3 activity, a marker for cellular apoptosis, in melanoma cells increased significantly in the presence of ME. The proliferation inhibitory effect of ME on melanoma correlated with decreased pro-proliferative molecule cyclin B. The pro-apoptotic effect of ME correlated with decreased anti-apoptotic molecule Bcl-2. Mangosteen constrains growth of melanoma by downregulation of cyclin B and Bcl-2. More research needs to be done to uncover the how to use mangosteen extract as a clinical treatment.

◆ 40 G ◆

Olive extract inhibits growth of HeLa cervical cancer cells

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Cervical cancer (CC) is the second deadliest for women between the ages of 20 to 39 years. Even with prevention tactics for screening, incident rates and mortality of CC remain high. Olive has been shown to have many beneficial effects in humans concerning cardiovascular disease and inflammation. Despite these promising benefits, little is known about its effect on CC. This study was designed to examine if olive extract (OE) had any significant effect on the HeLa CC cells and, the potential mechanisms behind it. We utilized clonogenic survival assay, quick cell proliferation assay, and caspase-3 activity to investigate the effect of OE on proliferation and apoptosis of CC cell line HeLa. To investigate the mechanisms behind these findings, RT-PCR and immunohistochemistry (IHC) were performed. OE was found to inhibit the growth and proliferation of HeLa cells. In comparison to the control, the percentage of colonies as well as the optical density of the CC cells was found to be decreased. In addition, the relative activity of caspase-3, an apoptotic molecule, was increased after treatment with OE. The anti-proliferative effect of OE on HeLa cells correlated with the increase of an anti-proliferative molecule p21. However, the pro-apoptotic effect of OE was not correlated with change of major pro-apoptotic or anti-apoptotic molecules tested in this study. Our study suggests that OE inhibits growth of HeLa CC cells by upregulation of p21. Further study of OEs effects on CC and other cancers is warranted by these results, including investigation into the anti-apoptotic findings

◆ 41 G ◆

Mango: fruit for the enhancement of melanoma immunotherapy

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Skin cancer is the most common form of cancer and melanoma accounts for the most deaths related to skin cancer. Melanoma rates continue to increase despite greater understanding of risk factors and the importance of early detection. The PD1/PDL1 (PDL2) pathway functions to inhibit the anti-tumor function of T-cells. Because of this, disruption or reduction of the PD1/PDL1 pathway has demonstrated increased anti-tumor immunity. Two drugs, nivolumab and pembrolizumab, are currently in use to achieve this pathway disruption for the immunotherapy treatment of melanoma. Mango, a tropical stone fruit, was investigated in this study to identify its potential effect on melanoma immunotherapy through PD1, PDL1, and PDL2 expression. RT-PCR was used to evaluate the mRNA expression of PD1, PDL1, and PDL2 within the melanoma cell line CRL-11147, while in the presence and absence of mango extract (ME). PD1 expression was not detectable in melanoma cells. However, PDL1 and PDL2 were expressed in the cell line. PDL1 demonstrated increased mRNA expression in the presence of ME compared to expression in the absence of ME. Furthermore, PDL2 displayed similar mRNA expression in the presence and absence of ME. PDL1 and PDL2, but not

PDL1, were constitutively expressed in melanoma. Mango extract demonstrated no effect on the mRNA expression of PDL2 while significantly decreasing the expression of PDL1. PDL1 inhibition has been linked with improved prognosis for melanoma patients and encourages further exploration of mango's enhancement of melanoma immunotherapy.

◆ 42 G ◆

The effect of olive on expression of costimulatory molecules OX40L and ICOSL in prostate cancer

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Prostate cancer (PCa) is the number one non-cutaneous cancer in the USA and the second most common cancer in men worldwide. Side effects to these treatments, barriers to healthcare access, and the threat of mortality of PCa warrant the investigation of novel treatment strategies. The expression of OX40L and ICOSL has been demonstrated in cancer cells, but their roles in cancer growth have still not been established. The inhibitory effects of olive extract (OE) have been established in colon and lung cancers, but this inhibition has yet to be investigated in PCa. The effects of OE on the expression of OX40L and ICOSL also has yet to be explored. This study seeks to investigate the effects of OE on the growth of PCa as well as the effects of OE on the expression of OX40L and ICOSL in PCa. The effects of olive extract (OE) on LNCaP prostate cancer cell lines were assessed using clonogenic cell survival assay and quick cell proliferation assay. The effects of OE on expression of OX40L and ICOSL was assessed using RT-PCR and immunohistochemistry (IHC) Treatment with OE resulted in a significant decrease in the percentage of LNCaP colonies as well as a decrease in OD value. OE treatment also resulted in significantly increased mRNA expression of OX40L and ICOSL, supported with OX40L and ICOSL IHC. Olive extract inhibits growth of prostate cancer and increases expression of both OX40L and ICOSL. Future studies should be directed towards investigating the potential roles of OX40L and ICOSL in this inhibition.

◆ 43 G ◆

The effects of remote ischemic conditioning on renal NLRP3 and iNOS levels in chronic intermittent hypoxia versus normoxia

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Sleep apnea is a chronic condition that is associated with cardiovascular and metabolic disease. Current therapeutic interventions focus on improving oxygenation, weight loss, and treating concurrent disease states. Hypersensitivity of the peripheral chemoreflex due to recurring intermittent hypoxia and the subsequent abnormal neural function is one mechanism previously demonstrated to lead to these disease states. Remote ischemic conditioning (RIC) is a simple intervention that has been shown to have positive effects on neural and vascular function, yet its efficacy as a therapeutic intervention in treating sleep apnea's harmful effects has not been studied. Using chronic intermittent hypoxia (CIH) in rats as a pre-clinical model for sleep apnea, this study sought to test the effects of RIC on the peripheral chemoreflex as well as cardiovascular and renal endpoints. One group was subjected to CIH episodes for approximately 8hr/day for 14 days. The other group was subjected to the same handling and placement in chambers but without the hypoxic episodes. Seven days into the CIH protocol, both groups were treated with RIC. For the RIC protocol, rats were lightly anesthetized and received 6 cycles of 5-minute limb ischemia, each followed by 5 minutes of reperfusion. Following terminal experiments, renal tissue samples were harvested. Using Western blot analysis, we assessed the expression of two inflammatory markers in renal samples, NLRP3 and iNOS. Though preliminary, we demonstrated no statistically significant differences in these inflammatory markers between the two groups. These insights allow us to evaluate how RIC may impact end-organ damage in CIH.

◆ 44 G ◆

Genetic profiling of the hippocampus during peripheral chronic inflammatory pain

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Brain mechanisms linking chronic pain conditions and development of comorbid clinical depression are still largely unknown. Here, we used a genome-wide microarray analysis to examine the genetic profile of the hippocampus, a limbic region that regulates mood and stress responses, from male rats exposed to 21 days of inflammatory pain. Bioinformatic gene network/canonical pathways analyses have identified significantly dysregulated genes with known roles in either neuroinflammation or neurodegenerative processes. Akt (protein kinase B) was identified as the main network hub gene. Altered activity of Akt-related signaling pathways has been linked to both the development of depressive state and antidepressant treatment. Furthermore, lipocalin-2 (Lcn2) or NGAL was identified as one of the highest upregulated genes (~ 2-fold) within the hippocampus during chronic pain state. Lcn2/NGAL is an iron-related protein with roles in innate immune response and cell differentiation/maturation that was recently implicated in regulation of emotional behaviors and cognitive function through regulation of neuronal excitability and dendritic spine formation/maturation. Besides the hippocampus, robust increases in Lcn2/NGAL mRNA were also observed within the prefrontal cortex (PFC) and anterior cingulate cortex (ACC), as well as in the brains of female rats exposed to the same pain paradigm. Overall, the results of this study continue to strengthen the idea that dysregulation of genes involved in neuroinflammatory and neurodegenerative processes in the hippocampus and other limbic brain areas may be involved in the development of mood disorders during the chronic pain state.

◆ 45 G ◆

The oncogene MYC targets the branched chain amino acid metabolism in human non-Hodgkin lymphoma

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Non-Hodgkin Lymphoma (NHL) accounts for 4% of the annual cancer incidence. While therapeutic strategies to combat NHL have advanced, NHL continues to be resistant to current treatments. MYC, an oncogene overexpressed in NHL, activates genes involved in cell proliferation. By using the eukaryotic promoter database, we found MYC-binding sites in the promoter regions of genes (BCAT1, BCAT2, and BCKDHA) encoding enzymes in the metabolism of the branched-chain amino acids (BCAAs). BCAT1 and 2 encode the cytosolic and mitochondrial branched-chain aminotransferases, while BCKDHA encodes the E1 α subunit of the branched-chain ketoacid dehydrogenase complex. We hypothesized that MYC activates these genes and causes an increase in BCAA metabolism in lymphoma. To address this hypothesis, we used the genomic platform (R2) and compared the gene expression of BCAT1&2, BCKDHA and MYC in samples from patients with diffuse large B-cell NHL and control tissues. All genes were elevated in patients with B-cell NHL compared to controls, and there was a positive correlation between the increased expression of MYC and the BCAA metabolic genes. Next, we propagated human NHL cells and control B lymphoblasts and found that the NHL cells overexpressed MYC compared to the control cells. Treatment of the NHL cells with the MYC inhibitor 10058-F4 and the BCAA antagonist N-acetyl leucine amide further revealed that inhibiting MYC and BCAA uptake reduces NHL proliferation and viability. These results demonstrate that NHL cells need MYC and BCAAs to survive and will serve as a foundation to target BCAA metabolism for the treatment of NHL.

◆ 46 G ◆

A novel bacteriophage targeting the virulent opaque variant of *Acinetobacter Baumannii* clinical isolate AB5075-UW exhibits a narrow host range

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Acinetobacter baumannii (AB) are bacteria that cause various nosocomial infections, are notoriously multidrug-resistant, and exhibit high-frequency phenotype switching. These traits exacerbate the morbidity and mortality associated with AB infection. AB can switch between two morphotypes, called virulent opaque (VirO) and avirulent translucent (AvT). VirO and AvT differ in colony appearance and other phenotypes such as virulence in animal models. Recently, bacterial viruses, called bacteriophages, that target and kill AB have been used as therapies to treat pan drug-resistant infections. Since these bacteriophages are almost exclusively strain-specific, additional bacteriophages that target VirO, and to a lesser extent AvT, need to be isolated and characterized. AB5075-UW, an AB clinical isolate that exhibits VirO/AvT switching, was mixed with activated sludge obtained from the Des Moines Metropolitan Wastewater Reclamation Authority

to enrich for bacteriophages. A phage targeting AB5075-UW-VirO was isolated and host range analysis was run to determine its ability to kill other AB clinical isolates, including 25 strains exhibiting VirO/AvT switching and 15 strains where phenotypic switching was not seen. The host range of a previously isolated phage targeting AB5075-UW-AvT was also determined. Herein, we report the isolation of a bacteriophage that targets AB5075-UW-VirO and exhibits a narrow host range by targeting three additional AB isolates termed AYE, MSRN959-VirO, and MSRN337038-VirO. Our ultimate goal is to create a well-characterized bacteriophage collection against a diverse array of different AB clinical isolates and allow for the rapid generation of therapeutic bacteriophage cocktails to treat AB-mediated infections.

◆ 47 G ◆

Effect of remote ischemic conditioning on hypothalamic NLRP3 and Iba1 expression in male rats subjected to chronic intermittent hypoxia versus normoxia

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Obstructive sleep apnea (OSA) has been associated with many vascular diseases including ischemic stroke. It was found that patients with OSA and stroke presented with elevated levels of an atherogenic pro-inflammatory marker. Studies have also shown that remote ischemic conditioning (RIC) can be used to protect tissues against ischemic damage due to various medical conditions. For example, a mouse study has shown that RIC can improve oxygenation to ischemic brain tissue in a stroke model. However, we do not fully understand the relationship between RIC and OSA. In our rat study, we modeled OSA in rats through providing chronic intermittent hypoxia (CIH) and measured levels of protein markers from the hypothalamus tissue. Male rats were divided into two groups, CIH and AIR. The CIH group received pulsatile 10% O₂ while the AIR group received constant air flow, 8 hr/d for 14d. Seven days into the CIH protocol, both groups were then treated with RIC, where rats were lightly anesthetized and received 6 cycles of 5 minute limb ischemia, each followed by 5 minutes reperfusion. We then analyzed the hypothalamus tissue using Western Blot for an inflammatory marker, NLRP3, and a marker for microglial activation, Iba1. We found that NLRP3 was not significantly elevated in the CIH group (0.303±0.068, AIR, vs. 0.432±0.145, CIH; P=0.26) and Iba1 was unchanged (0.112±0.004, AIR, vs. 0.110±0.020, CIH; P=0.90). These preliminary results suggest that RIC could mitigate some tissue damage induced by CIH, but this should be further explored with sham-controlled experiments.

◆ 48 U ◆

A comparative analysis of TP53 gene expression in different female breast cancer tissues

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Cancer is an unpredictable and life-changing disease that has become one of the leading causes of death globally. The objective of this study was to examine the *TP53* tumor suppressor gene, which prohibits uncontrolled cell division when functioning properly. A common cancer affecting females is breast cancer, which influences breast cell growth. Through the R2 genetic platform, *TP53* gene expression data from cancerous breast tissues before chemotherapy (pre-chemotherapy, n=32) and post-chemotherapy were collected. In post-chemotherapy there were different responses to treatment that varied from good (n=5), mid (n=17) and bad (n=7) responders among the female patients. The patients were graded on their response to chemotherapy through the Miller and Payne Grading scale (1-5) with 1-2 being no significant reduction in cellularity at the tumor site and 4-5 being a significant reduction in cells at the tumor site. The *TP53* gene expression was compared between pre-chemotherapy tissue and post-chemotherapy tissues. The hypothesis was that there would be a statistically significant difference between the *TP53* gene expression among breast cancer patients before and after chemotherapy and between each chemotherapeutic response. However, after obtaining p-values, the study revealed that there was no statistically significant difference between pre-chemotherapy group and the post-chemotherapy group and between each of the chemotherapeutic responders in the *TP53* gene expression in breast cancer. Thus, after examining different responses to chemotherapy and comparing it to pre-chemotherapy tissue, we concluded that the *TP53* gene is most likely not a leading gene in the development of breast cancer in females.

Estrogen regulates voluntary running behavior in rats

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Despite the myriad social and health benefits of exercise, humans display heterogeneous levels of participation. Significant progress has been made in identifying molecular events, systems, and mechanisms that support exercise's beneficial effects, but it is not clear yet what regulates exercise behavior itself or serves to maintain prolonged chronic exercise behavior. The human heterogeneity in voluntary exercise can be recapitulated in a rodent model of wheel running, a behavior with high rewarding properties. While rats given continuous access to running wheels all began with low running activity, a 3-week training program dramatically increased running activity and uncovered a wide range of individual differences in running behavior. In addition, we have also identified intriguing sex differences in this model. Compared to age-matched males, female rats exhibited significantly higher levels of average daily running. When assessing individual female rats' running behavior, we also observed a repetitive peak-valley pattern of running activity, with peaks coinciding with the proestrus stage (highest estrogen level) in the rat estrous cycle. Bilateral ovariectomy (OVX) not only lowered their overall running activity, but also completely eliminated cyclical variations. Furthermore, low dose estrogen replacement via osmotic mini pumps in an OVX background restored running activity to pre-OVX levels, and acute estradiol injections were able to replicate running peaks. Collectively, our results suggest estrogen regulates running activity which offers a unique opportunity to examine the mechanisms responsible for driving exercise behaviors. Further studies identifying molecular mechanisms that mediate estrogen's effects are currently underway.

◆ 50 G ◆

Medial orbital floor thickness and asymmetry: implications for blow-out fractures

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Studies on blow-out fractures point to the relevance of orbital floor thickness, with some indicating thinner floors medially. However, previous studies are limited by small samples of homogenous populations. Although the assumption is right and left sides are symmetrical, most studies are unilateral. Our study uses CT scans of modern human crania across a geographically diverse sample (n=56) with bilaterally intact orbital floors. Orbital thickness data was collected to examine for differences between medial and lateral thicknesses bilaterally (e.g., medial thickness right vs. left). Using 3DSlicer, orbital thickness was taken medially and laterally relative to the infraorbital canal at 0, 1, and 2mm positions, starting directly at the first visible instance of the posterior aspect of the infraorbital canal. Wilcoxon sign ranked testing was used to compare right- versus left-sided thicknesses at each position. Data yielded statistically significant differences in right versus left sides for all positions of the medial thicknesses, including average medial thickness (all p-values <0.05); no significant differences were found for lateral thicknesses (all p-values >0.05). This suggests orbital floor medial thickness is asymmetrical. Blow-out fracture literature implicates thin orbital floors in the pathogenesis of medial and lateral fractures. Current surgical management of orbital fractures involves placement of an implant at the fracture site, which can be molded depending on its composition. Although reconstruction is typically done based on the un-affected side, asymmetry may be a negative factor. We aim to provide more anatomical data to the surgical repair of orbital fractures.

◆ 51 G ◆

Effects of MST-312 on herpes simplex virus glycoprotein D interactions with cellular receptors

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Herpes simplex virus (HSV) causes chronic infections that may require long-term treatment in at-risk populations. Strains of HSV that are resistant to the current standard drug therapies have been detected, presenting a need to develop new antiherpetic drugs. Previous studies determined that the synthetic telomerase inhibitor MST-312 can reduce HSV replication both during and after viral entry into cells. However, the mechanism by which MST-312 suppresses viral replication is not currently understood. The goal of this project is to determine how MST-312 reduces viral entry into cells. HSV uses viral glycoproteins in the virion envelope to bind to receptors on cell surfaces to mediate entry. We

hypothesized that MST-312 reduces binding of viral glycoprotein D (gD) to transmembrane protein nectin-1, which is an important step in viral entry. To test this, we utilized a modified ELISA technique in which wells with gD bound to nectin-1 exhibit a chromogenic reaction. Absorbance was measured to quantify the amount of gD bound to nectin-1 in the presence or absence of 20 – 100 μ M MST-312. Contrary to our hypothesis, a small but statistically significant increase in binding of gD to nectin-1 was observed at all MST-312 concentrations. The impact of this small increase of binding on the suppression of viral entry by MST-312 is currently unknown. Looking forward, we plan to test the effects of MST-312 on the binding of viral glycoproteins to other membrane receptors known to contribute to the HSV entry process using similar methods.

◆ 52 G ◆

Changes in AMPA Receptor Trafficking Observed in Protracted Ethanol Withdrawal

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Dysregulation of glutamatergic transmission within the brain is thought to underlie the development and expression of drug craving/relapse. Increased trafficking of α -amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid receptors (AMPA) has been observed in animal models characterizing short-term ethanol withdrawal (~24h). Investigating these alterations after longer term withdrawal periods (30-45 days) may provide new insight into how this dysregulation alters propensity to relapse/drug craving. Thus, we are investigating AMPAR expression following chronic intermittent ethanol (CIE) exposure and an extended withdrawal period in male and female rats. We focused on the basolateral amygdala (BLA), as glutamatergic signaling in this region is robustly modulated by short term (24h) withdrawal and regulates anxiety-like behaviors expressed during withdrawal. 5–9 week-old male and female rats undergo a CIE exposure protocol (12hr/day, 4d on/3d off, 3 cycles) and are allowed to enter protracted withdrawal (>40days). The BLA was dissected and treated with a cell impermeant tag bis(sulfosuccinimidyl)suberate (BS3). Western blots were run to identify pools of BS3-tagged surface proteins and untagged intracellular proteins using antibodies towards GluA1, GluA2, and GluA3 AMPAR subunits. Preliminary data suggest our BS3 treatment was successful, and we are able to identify proteins isolated to each compartment. On-going studies are expected to indicate an increase in AMPAR trafficking of GluA1 subunits in CIE/Withdrawal animals in comparison to control tissue. We also hypothesize that CIE/Withdrawal female animals will show smaller increases in AMPAR surface expression in comparison to both female control and male withdrawal animals.

◆ 53 G ◆

Impact of fibrinogen and prothrombin concentrate on clotting time in a model of obstetric hemorrhage: an in-vitro study

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Management of coagulopathy during obstetric hemorrhage remains a challenge. Although prothrombin concentrates have been used in a variety of clinical settings they are still considered to be used only as a last resort in obstetrics secondary to a lack of data. We therefore created an in vitro investigation examining the impact of three different doses of prothrombin concentrates on coagulation as measured by thromboelastometry. Elucidate the role of fibrinogen and prothrombin concentrate on clotting time in obstetric hemorrhage. After informed consent blood was obtained from 34 otherwise healthy term singleton gestation patients. Blood was then analyzed and diluted 95% with crystalloid. A sample of washed red blood cells was added to simulate red blood cell transfusion. Two different levels of fibrinogen repletion were then added to samples to simulate cryoprecipitate transfusion. Finally, one dose of prothrombin concentrate (10 U/kg, 15 U/kg, or 25 U/kg) was added to the sample. Samples were analyzed by thromboelastometry, specifically the FIBTEM test. FIBTEM clotting times were greatly prolonged from baseline levels in the dilutional samples. After repletion with fibrinogen and prothrombin concentrates 7/31 (22.5%) of samples had a clotting time > 80s in the 50% fibrinogen repletion arm and no samples had a clotting time >80s in the 100% fibrinogen repletion arm. Clotting time values approached their baseline levels at each dose of prothrombin concentrate. Median clotting time in the 100% fibrinogen repletion arm was under 80s prior to the administration of prothrombin concentrate. Commonly cited doses for prothrombin concentrates in hemorrhage should not be applied to the obstetric patient. After fibrinogen correction several

samples required no further correction, highlighting the importance of frequent testing at the point of care. More work is needed to elucidate the ideal dose of prothrombin concentrate for obstetric hemorrhage.

◆ 54 G ◆

Adherence to administration of calcium chloride via a central line

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MercyOne Des Moines Medical Centers observed instances of calcium chloride administration via peripheral intravenous (IV) line. Though administration of calcium chloride is safest via central IV line. If calcium chloride is given in a peripheral line, it can cause extravasation with tissue compromise. The purpose of this study was to quantify calcium chloride administration via a peripheral line to target education. This was a retrospective, chart-review of adult patients admitted to Mercy One West Des Moines or Des Moines Medical Center from September 2020 through February 2021. The primary objective of this study was to determine the incidence of appropriate calcium chloride administration. The secondary objectives were to categorize dose, technique, time, and location of calcium chloride administration. Other data collected included patient location, IV lines available at time of administration, and if the order was part of a power plan. Ninety doses of calcium chloride were administered during the relevant time frame and were included in the analysis. Eleven (12.2%) doses were administered via peripheral line, 47 (52.2%) were administered via central line, and 32 (35.6%) had unknown categorization of lines for administration. Of those administered peripherally, 8 (72.7%) had a central line available at time of administration. Most calcium chloride doses (n=43/90) were administered either in a peripheral or unknown IV line. This data shows that adherence to central administration of calcium chloride can be improved. Documentation for the type of IV line could be improved to better understand the incidence of peripheral administration.

◆ 55 G ◆

The burden of adverse childhood experiences in children and those of their parents in a burn population

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The aim of this study was to determine the prevalence, type, and associations of parental and child adverse childhood experiences (ACEs) in children presenting with burn injuries. Parents of burned children completed an ACE-18 survey, including questions on parent and child ACEs, needs, and resiliency. Demographics, burn injury, hospital course, and follow-up data were collected. Family needs and burn outcomes of children with and without ACEs' exposure (no ACE vs one to two ACEs vs three or more ACEs) were analyzed. $P < .05$ was considered significant. Seventy-five children were enrolled-58.7% were male, 69.3% white. The average age was 6.0 ± 5.2 years. The average total burn surface area was $4.4 \pm 5.7\%$ (0.1-27%). Parent ACE exposure correlated with child ACE exposure ($r = .57$; $P = .001$) and this intensified by increasing child age ($P = .004$). Child ACE exposure showed a graded response to family needs, including food and housing insecurity and childcare needs. Stress and psychosocial distress of the parents was significantly associated with their children's ACE burden. The ACE burden of parents of burned children can affect the ACE load of their children. Burned children with more ACEs tend to have significantly more needs and more family distress. Awareness of past trauma can help identify a vulnerable population to ensure successful burn recovery.

◆ 56 G ◆

The link between osteopathic manual treatment (OMT) and proprioception

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The purpose of this study is to investigate the mechanism of osteopathic manipulative treatment (OMT). Previous studies have shown the effectiveness of OMT on decreasing patient symptoms by removing somatic dysfunctions. The mechanism behind the procedure of removing somatic dysfunctions has been theorized as OMT changing proprioception. A previous pilot study performed in 2019, indeed showed changes in proprioception after OMT treatments. The current study expands upon the initial study by adding another mode of measurement of proprioception and extending the treatment sessions to four. At this time, there is no method that adequately isolates proprioception and measures it. We used two modalities of measuring proprioception to further isolate it: force plate balance measurement on one and two legs and arm arc measurement at different degrees. Here, we present case-controlled findings comparing results from our measurement modalities before and after an initial OMT treatment.

◆ 57 G ◆

Cervical range of motion among those with sinus headaches

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Cervical range of motion (ROM) is used as a criterion to differentiate among some headache types. While ROM is impaired in those with cervicogenic headaches, ROM impairments in migraineurs are inconsistent. A recent study showed impaired cervical ROM in people with sinus headaches; however, their headaches were self-diagnosed. This current study seeks to determine if there is a difference in cervical ROM in people with physician-diagnosed sinus headaches. Participants included those diagnosed with sinus headaches (SHA) and asymptomatic controls (AC) (n=17). Active cervical ROM was measured in each direction. Passive upper cervical rotation was also measured. Measurements were taken with a cervical range of motion (CROM) device by a single-blind researcher. For the SHA group, simple linear regression analysis was performed to determine if reported headache severity predicted cervical ROM. Independent t-tests were done to determine ROM differences between groups. Range of motion was similar between the two groups for flexion ($t=0.130, p>.05$) extension ($t=1.288, p>.05$), lateral flexion ($t=3.040, p>.05$), rotation ($t=1.950, p>.05$), and upper cervical rotation ($t=0.192, p>.05$). There was no significant relationship between headache severity and flexion ($R^2=.155$, $F(1,7) = 1.278$, $p=.296$), extension ($R^2=.002$, $F(1,7) = 1.278$, $p=.296$), lateral flexion ($R^2=.124$, $F(1,7) = 0.987$, $p=.354$), rotation ($R^2=.214$, $F(1,7) = 1.902$, $p=.210$), or upper cervical rotation ($R^2=.018$, $F(1,7) = 0.126$, $p=.733$) ROM. People diagnosed with sinus headaches did not have decreased cervical ROM compared to controls. Their reported headache severity did not predict cervical ROM. Further research is in progress, this is preliminary data from a larger study.

◆ 58 G ◆

Incidence of chemical restraint with intramuscular olanzapine and ziprasidone at MercyOne Des Moines Medical Center

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Chemical restraints are medications used in addition to or in replacement of the patient's regular drug regimen, to control extreme behavior during an emergency situation. Olanzapine and ziprasidone are commonly used as chemical restraints within the hospital setting.^{1,2} While they aid in the management of behavior, there are side effects associated with them such as QTc prolongation.³ Further research was needed to determine if chemical restraints were being appropriately used, administered, and documented. This was a retrospective, chart-review study of adults (>18 years), who had received at least one dose of olanzapine or ziprasidone while at MercyOne Des Moines between May 1 and July 31, 2021. The primary outcome of the study was to quantify the incidence of the use of olanzapine or ziprasidone for chemical restraint. The MercyOne Des Moines Institutional Review Board approved the study. Seventy-one patients met the criteria for inclusion in this study, and two of these patients received at least one dose of each agent. Only 5 patients received a dose of ziprasidone. Most doses (n=56) had a documented reason of agitation. Nearly 70% (n=47/68) of patients receiving olanzapine had an ECG checked prior to drug administration. Over half of these demonstrated a prolonged QTc interval (QTc > 430 msec or > 450 msec). Use of chemical restraint agents at MercyOne Des Moines shows opportunities

for improvement. There were minimal adverse effects documented within this population. However, there was also minimal documentation of the reasons for use and administration.

◆ 59 G ◆

Optimal location of fixation for posterior tibial tendon transfers through the interosseous membrane

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Drop foot, a loss of dorsiflexion at the ankle joint, is a familiar complication that occurs when the common peroneal nerve is injured. Often with this condition there is a loss of function to both the tibialis anterior and peroneal tendons. Some root causes of drop foot include trauma, complications secondary to surgery, disc herniations, CVA and various genetic conditions. While less severe cases of drop foot can be managed with physical therapy and bracing, certain situations require a surgical approach to restore function. One method to reestablish dorsiflexion at the ankle involves a transfer of the posterior tibial tendon (PTT). Many different techniques for transferring the PTT have shown positive results in terms of correcting drop foot. However, there is limited research on the optimal fixation point in the mid-foot for this procedure when passing through the interosseous (IO) membrane. The purpose of this study is to investigate these fixation points to determine which site can provide the best functionality for patients.

◆ 60 G ◆

Prophylactic antibiotic use in Gustillo Type III open fracture

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Type III open fractures can be life- and limb-threatening injuries and are high risk for infection. Proper selection and prompt administration of prophylactic antibiotics are critical to reduce infection risk. A local, evidence-based guideline was created to guide selection of the antibiotic with consideration to open fracture classification, wound contamination, and patient allergies. The purpose of the study is to evaluate adherence to the guideline for Type III open fracture antibiotic treatment at a regional Level I Trauma center and the efficacy of these guidelines in preventing infection in Type III fractures. A retrospective study was conducted at a Level I trauma center, to evaluate selection, timing, and duration of antibiotics and rate of infection. Patients included were adults in the trauma registry treated for Type III open fracture between September 1, 2020 to August 31, 2021. Data on location and type of open fracture, wound contamination, patient's antibiotic allergies, antibiotic therapy, fracture treatment (debridement, fixation, or wound closure), and infection were abstracted from the electronic medical record. Ten patients were included in the analysis. Antibiotic selection followed guidelines in seven patients (70%). The median time to first antibiotic dose was 58.5 minutes (range 12-264 minutes) and median duration was 2.5 days (range 1-13 days). One patient (10%) developed an infection. Adherence to the local guideline for management of Type III fractures is suboptimal. Quality improvement measures should be taken to increase adherence to guidelines and minimize infection risk.

◆ 61 G ◆

Ankle joint articulation differences following ORIF of the fibula with and without deltoid ligament repair: a cadaver study

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A primary goal of ankle fracture repair is re-establishing the ankle joint mechanics to the level that they were pre-injury. While allowing for natural and pain free motion, the accurate restoration of an ankle fracture to closely approximate pre-injury mechanics and anatomy, further reduces the likelihood of complications such as post-traumatic arthritis due to abnormal joint articulation. While syndesmotic and osseous stability via open reduction internal fixation (ORIF) of the

fibula is well established, the decision to also repair the deltoid ligament, or instead leave it to heal naturally, is a topic of controversy. Previous research is not coherent on the issue. This study aims to address the differences in contact characteristics of the ankle joint in cadaver legs varied by fibular ORIF with and without primary deltoid repair. Another potential variable is fibular ORIF with and without a syndesmotic screw, further varied by 3 versus 4 cortex depth. Control will be the same cadaver leg pre-fracture. Cadaver legs will be dissected for placement of FujiFilm pressure mapping film into the articular space between the tibia and talus. The legs will then be subjected to axial loading to a physiologic force via a pneumatic piston rig. The pressure mapping film can then be removed and analyzed for articular contact points and pressure gradient via a scanner with accompanying software. This process will be repeated for the experimental fracture and repairs groups described above.

◆ 62 F ◆

Digital accessibility: a practical approach

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In a fast-paced world where everyday life involves digital usage, digital accessibility is essential. Digital accessibility is the act of making digital products (websites, online materials, online courses, etc.) available for individuals with and without disabilities. This research project aimed to help an educator apply digital accessibility to a course and understand the feasibility of the application. The educator was trained in aspects of digital accessibility as well as application. The educator regularly worked with an Accommodations Specialist to ensure that digital accessibility was correctly applied to course materials. For example, one application was adding captions to images on lecture materials. Before course content dissemination, students voluntarily completed a survey regarding their use of digitally accessible materials in courses. After course completion, the students voluntarily completed the same survey identifying their use of digitally accessible items in the course. The survey results were limited by a small number of respondents but revealed that the inclusion of digitally accessible materials was helpful for students when accessing course materials. Conclusions from this case study reveal a practical approach to improving digital accessibility within the classroom setting.

◆ 63 G ◆

Cardiovascular outcomes of SGLT2 inhibitors in patients with/without diabetes and heart failure: a meta-analysis by sex and race

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Heart failure (HF) is a leading cause of morbidity/mortality. Type 2 diabetes mellitus (T2DM) is a risk factor for HF and the risk of developing HF is different between sexes and races. Sodium-glucose co-transporter type 2 inhibitors (SGLT2i) decrease the risk of HF hospitalization (HHF) and CVD when added to standard care in patients with/without T2DM and with/without HF. However, the efficacy of these drugs across sex or race is not well documented. Outcome data were extracted from six studies and used in meta-analysis to compare relative risk (RR) of HHF/CVD in SGLT2i treated patients across sex and race. Compared to placebo, SGLT-2i reduced RR of HHF/CVD in men (0.82; 95% CI, 0.77-0.87; P <0.001) and women (0.76; CI, 0.69-0.85; P<0.001) irrespective of diabetes. HHF/CVD decreased significantly in white (0.84; CI, 0.78-0.90; P<0.001) and Asian patients (0.67; CI, 0.58-0.77; P<0.001). Black patients (0.74; CI, 0.52-1.06; P > 0.104) and other races (0.73; CI, 0.72-0.85; P>0.258) did not show statistically significant reductions in RR. SGLT-2i reduces the risk of HHF/CVD for both sexes as well as white and Asian patients. The reason for the lack of significance in Blacks and other races is not known, but these results may aid in examining what areas of the healthcare system need modifications for equitable treatment in heart failure.

◆ 64 G ◆

Medical student reflections after participating in a sexual assault response team elective

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The prevalence of sexual victimization in the US is between 39-46%. Educators have advocated for inclusion of care for sexual assault victims in the medical school curriculum. Des Moines University, College of Osteopathic Medicine offers a

“Sexual Assault Response Team” (SART) clerkship. Students learn from a multidisciplinary team providing initial treatment, evidence collection and follow up care to victims of sexual assault. Participating students are required to write a reflection essay at the conclusion of the clerkship. Research question: What interprofessional interactions, professional attributes, ethical constructs, and core competencies are the students exposed to and what impacts on medical student wellbeing are experienced on the SART clerkship. After IRB approval and a pilot study, a four-person team independently evaluated 24 consecutive essays (1 Year) and recorded their impressions using a set of pre-established domains. Each entry was further classified a positive, negative or hybrid experience. No student had a conflict with their moral values or had a negative impact on their wellbeing.

◆ 65 G ◆

Are osteopathic medical students adequately informed about health policy? A review of osteopathic medical school curricula

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Osteopathic students are trained to think of alternative explanations for a patient's disease. As delivering care requires physicians to apprehend an even more macroscopic picture of an individual health, it requires an appreciation for health policy and reform which effects providers and patients alike. Yet, the knowledge of how policy effects economics, delivery, and access to care is still lacking in medical education. Numerous sources draw attention to the gaps in current teaching of health economics and policy in medical programs. Osteopathic Core Competencies for Medical Students as listed by the American Association of Colleges of Osteopathic Medicine (AACOM) require that medical students understand a broad range of health policy topics. However, Doctor of Osteopathic Medicine (DO) curriculums across accredited programs reveal no standardized instruction of health policy. Given the importance of understanding health policy as future medical professionals, the proposed study will examine:(1) how much time is devoted to health policy education in DO programs, (2) what didactic methods have been used, and (3) what subtopics were covered in the curriculum. Such data would help accurately describe the current teachings of health policy in U.S. osteopathic programs and assess progress towards meeting the requirements of residency programs and future patients.

◆ 66 F ◆

Importance of practical research experience and accomplishments for DMU student residency placement

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Since a solid understanding of the research process, methodology and evidence quality is essential for graduating students, research needs to be integral part of the undergraduate medical curriculum. It is less clear how important practical research experiences and accomplishments are for DMU graduates' careers. The National Residency Match Program (NRMP) publishes a wealth of information on residency applicants' qualifications and success rates in the form of residency director surveys and detailed breakdowns of characteristics of matching applicants. For this study, the 2020 NRMP reports were correlated with DMU-COM data on residency placement from 2009-2021. The NRMP data show that DO students nationally list on average 1.9 research experiences and 2.9 research accomplishments (papers, publications and abstracts)– a significantly lower number than the MD graduates (3.6 and 6.9 respectively) with whom they will be competing for residency slots. However, the NRMP data show that for the specialties most often chosen by DMU graduates the number research experiences does not influence the likelihood of matching. Furthermore, in these popular specialties, residency directors do not put particular importance on research when deciding whom to interview or rank. The situation is different in more competitive specialties where research experiences of successful residency applicants are more numerous and more important for candidate selection. It is concluded that practical research experiences during undergraduate medical education are not equally important for all graduates, suggesting that tailoring research experiences to students' previous accomplishments and career choices are the most efficient way to allocate scarce research resources.

Thematic analysis of medical student responses to diversity and equity education

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Diversity and equity are unquestionably important components of comprehensive medical education. DMU implements a course specific to these needs as a part of its required DO curriculum to ensure students' ability to provide culturally responsive care. The focus on health equity continues to grow and the course was updated for the 2020 school year to better meet these needs. The current course focuses on the four themes of identity, communication, bias, and epidemiology. Each of these modules includes an array of learning experiences including community member panels and discussions, small group discussions, and self-directed e-learning modules. To meaningfully assess course changes, all first-year osteopathic medical students were given the option to participate in pre- and post-course digital surveys, and some were selected to complete a university post-course evaluation. These consisted of quantitative response scales assessing course outcomes and prompted students for qualitative feedback about their experiences. Thematic analysis of these qualitative post-course survey responses provided insight into overall student reception and learning. Overwhelmingly, responses included positive statements regarding the community member panels and the ability to have discussions in a safe space with their peers during an isolating year. Additionally, there was support for the course's grading scheme, lack of exams, and self-guided content. Students voiced difficulties with online learning and balancing an already heavy workload. Responses demonstrated the large range of student opinions and various levels of reactance regarding content. This data can inform future curriculum and course-level changes and improve DMU students' readiness to meet diverse population needs.

◆ 68 G ◆

Optimal fixation techniques for subtalar arthrodesis

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Historically, subtalar arthrodesis has been a commonly used surgical procedure for reconstruction of the foot and ankle. This can be due to a countless number of pathologic conditions, such as arthritis, trauma, and congenital deformities. Screw fixation has been used as the preferred method of fixation, historically. Previous research describes varying surgical methods, as well as conflicting evidence on success rates for subtalar arthrodesis. This specific study aims to evaluate different techniques of fixation to provide a consensus on the optimal outcome in surgical subtalar screw arthrodesis. Some differences include screw placement, screw angle, and number of screws. This will be achieved by using a Fujifilm Pressure Mapping System© to measure the compressive forces achieved between the talus and the calcaneus. A wide variety of location, number, and angle of screws and the addition of compression staples will be used in a fresh-frozen human cadaver study.

◆ 69 G ◆

Comparison of cultural competence level at matriculation for two doctor of physical therapy (DPT) cohorts

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Cultural competence is identified as essential for physical therapists. DPT education programs have implemented a variety of curricular activities to develop this attribute. Few studies have been published formally assessing the effectiveness of specific cultural competence educational activities in DPT education. Following a systematic literature review, the Inventory for Assessing the Process of Cultural Competence among Healthcare Professionals – Student Version (IAPCC-SV) was selected to measure DPT students' cultural competence at multiple points within a DPT curriculum. The purpose of this study was to compare the cultural competence levels of two DPT cohorts at matriculation to gather baseline data. The IAPCC-SV scale ranges from lowest to highest level: culturally incompetent, culturally aware, culturally competent, and culturally proficient. The mean score for cohort one was 58.8 +/-5.01 and cohort two was 57.9 +/-6.53 (score of 41-59 is considered culturally aware). There was no significance difference in matriculation cultural

competence level between cohorts (p-value= 0.32). The IAPCC-SV is divided into five constructs: Cultural Awareness (CA), Cultural Knowledge (CK), Cultural Skill (CS), Cultural Encounters (CE), and Cultural Desire (CD). There were also no significant differences by IAPCC-SV constructs between cohorts. Despite descriptive differences between cohorts including age, gender, state of residence, and race/ethnicity the matriculation cultural competence and construct levels were similar.

◆ 70 F◆

Formative assessment strategies to improve PA student knowledge in pharmacology

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The application and retention of basic science knowledge, such as pharmacology, during pre-clinical training is challenging given the large number of concepts and few opportunities to apply the information to patient encounters. The purpose of this study was to implement a formative assessment strategy to improve physician assistant student pharmacology performance. The strategy allowed for the repetitive practice and continuous engagement with lower order, foundational questions until mastery was achieved during a required medical pharmacology course. A student cohort enrolled prior to this implementation served as a control group (CTRL). Students enrolled in the course offerings with access to formative assessments served as the treatment groups (TRMT). There was a statistically significant increase (p=0.011) in performance of the TRMT groups as compared to the CTRL group on an institutionally written comprehensive exam. When detailing the change in question performance, there was a “Large” Effect Size (d=0.936) according to Cohen’s Standard on questions that were categorized as difficult items. These results demonstrated that the implementation of the formative assessment strategy had a positive impact on student performance and prepared the students to perform better on difficult questions. These findings support the use of a repetitive formative assessment strategy to improve student performance and learning outcomes within the discipline of pharmacology. Although short-term learning gains were evident, preliminary evidence does not find a long-term impact. Future studies will assess the longitudinal impact of the formative assessment strategies on learning outcomes across the pre-clinical and clinical training in the physician assistant program

◆ 71 G◆

Indices of walking skill reflect differences in function in older adults with good mobility

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The Walk Ratio (WR) and Figure-of-8 Walk (F8) measures of walking skill relate to physical and cognitive function¹⁻³, identifying disorders of neuromotor control. 3-5 We examined relation of measures to physical and cognitive functioning determining if individually or in combination WR and F8 detect early declines in mobility and function of Older Adults (OA) with good mobility. Secondary data of community dwelling OA with gait speed ≥ 1.1 m/s (n=80): variables included WR (step length/cadence), gait characteristics, and gait variability, F8 time, Late-Life Function & Disability Instrument overall, basic (BLE) and advanced (ALE) lower extremity function and cognitive function, Trails B time. Good and poor walking skill were defined by WR $>$ or ≤ 5.8 mm/steps/min; F8 \geq or $<$ 8s. ANOVAs examined group differences in physical and cognitive function, and across 4 combined groups [good WR-good F8; poor WR-good F8; good WR-poor F8; poor WR-poor F8] with linear trend test exploring use of combined measures. Good vs. poor WR-F8 walking skill were younger, had better function and longer steps (p<.05). Linear trends found for mean differences across combined WR-F8 groups in age, physical function (overall, BLE, ALE), cognitive (Trails B) function, and gait characteristics (speed, step length, step time, stride width variability); best to worse: good WR-F8 (n=29); only F8 good (n=12), only WR good (n=15), and poor WR-F8 (n=23), ptrend <.05. OA with good speed but poor WR and F8 time, were older with poorest physical and cognitive function. WR and F8 may improve screening for early decline in mobility and function.

Center of pressure during curved path walking; inform approaches to restore walking motor skill

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We aimed to identify age-related strategies in curved path walking mediolateral balance control by examining center of pressure (COP) data during the Figure-of-8-Walk-test (F8W). We hypothesized age- and performance-related differences in COP variables. Young adults (YA, n=23, mean age 23.7±1.2) and community dwelling older adults (OA, n=25, mean age 71.8±8.9). Groups performed the F8W over an instrumented walkway (Protokinetics, Inc). PKMAS software was used to identify right and left steps and export the COP trajectory of each step. COP trajectory data was used to calculate metrics describing the medial/lateral movement of the COP within each step. One-way ANOVAs were used to examine age-related differences. Tertiles of the fastest and slowest F8W times were compared to examine performance-related differences. Compared to YAs, OAs were slower and took more steps to complete the F8W. There were no group differences in any COP variable. Comparison of the slow and fast F8W performance groups revealed differences in medial-lateral COP range of the inside foot (3.55cm±0.63 vs 4.05cm±0.61, respectively, p=0.035) and outside foot (3.76cm±0.78 vs 4.43cm±0.61, respectively, p=0.012), and maximum lateral COP excursion of the inside foot (2.73cm±0.47 vs 3.10cm±0.51, respectively, p=0.044) and outside foot (1.69cm±0.41 vs 2.05cm±0.45, respectively, p=0.027). Individuals with the slowest times were predominantly older adults. This group exhibited reduced total medial/lateral COP ranges of both inside and outside steps and reduced maximum lateral COP excursion of both inside and outside steps. Greater maximum lateral COP excursion indicates efficient directional change towards the inner foot.

◆ 73 ◆

Shoulder movement measurement validity and reliability and different measurement tools

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Joint excursion measurement is needed in the clinical setting for diagnostic and intervention effectiveness assessment purposes; with the advancement of technology, tools that measure joint movements are becoming more readily available and at affordable prices. With these emerging technologies, comes the need of accuracy and repeatability of measurement. The purpose of this study was to examine the literature for current technologies that can be used to measure shoulder joint excursions appropriate for clinical setting. The reliability and validity of multiple tools were assessed e.g., Goniometer, Inclinator, 2D video, wireless wearable sensors (MOCAP), and Inertial Measurement Units (IMUs) against the gold standards of bone pins and 3-D fluoroscopy. While goniometers and inclinometers are today's common clinical tools, they are limited for dynamic task assessment, while 2D video, MOCAP technologies, and IMUs are more promising. IMUs are becoming more prevalent in use and were tested against motion capture technology in both short and long tasks. Short, or simple tasks (arm elevation) showed excellent validity (RMSE of 2.8-6.7°), the longer, or more complicated (workplace) tasks showed less validity (RMSE of 11.5±2.4°). Currently, we are in the process of evaluating the reliability of the MOCAP technology using simple evaluation tasks used in clinic such as weighted and rotated (full and empty can) arm elevations. In conclusion, the new emerging technologies are showing great promise with measuring joint excursion especially for IMUs, they are becoming more affordable and can go outside the lab into the clinical settings for ease of use in patient care.

◆ 74 G ◆

Scapulothoracic and scapulohumeral rhythm normative data: a systematic review

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The human shoulder is a highly complex joint that requires cohesive motion at the glenohumeral (GH), scapulothoracic (ST), acromioclavicular (AC), and sternoclavicular (SC) joints. The ST joint is capable of 3D motion composed of: Upward/Downward rotation, Anterior/Posterior tilt, and Internal/External rotation. The proportion of ST Upward Rotation to humeral elevation is a commonly used metric for shoulder motion evaluation and is known as scapulohumeral rhythm (SHR). The range of motion (ROM) of the ST is also frequently measured in biomechanical studies of the shoulder. There is great diagnostic and clinical utility in measuring and determining normal ST ROM, as there are numerous pathologies in which ST joint motion is limited. Our systematic review of the literature has shown: 1) There is no consensus for the normal ST range of motion in the literature. 2) The variety of methods used to measure scapular kinematics result in a broad range of values, further confounding the task of defining a normal ROM. 3) The literature describing scapular kinematics in functional tasks and activities of daily living has great variance in methodology and reporting, leading to a lack of cohesive values and information for commonly studied motions. 4) There is a need for standardized, cohesive reporting and methodology when studying scapular kinematics. 5) External rotation is the scapular motion with the most disagreement between seemingly robust studies.

◆ 75 G ◆

Is there a relationship between two quality of life measures in people with sinus headaches?

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Individuals with sinus headaches (SH) often experience a variety of symptoms that impact their daily lives. The Sino-Nasal Outcome Test (SNOT-22) is a tool to measure quality of life (QL) in people with rhinosinusitis. Although headaches can be associated with rhinosinusitis the SNOT-22 has no questions about headaches. The Headache Impact Test (HIT-6) was developed to measure QL in people with migraines, and has been used previously in a study of SH. Both questionnaires test QL, but the relationship between the two tests is unknown. The purpose of this study is to identify if a relationship exists between QL questionnaires in individuals with SH. This was a secondary analysis from a case control study examining musculoskeletal measures in people with and without self-reported SH. During a single session, participants (n=31 mean age of 34.7 ±9.9 y) completed the SNOT-22 and HIT-6 questionnaires and answered indicated headache duration. A Pearson Correlation was performed to explore the association of the questionnaires and headache duration. Mean scores; SNOT-22 (36.2 ±15.3), HIT-6 (56.6 ±7.1), headache duration (89.6 ±85.6 mo). Pearson Correlation between SNOT-22 and HIT-6 was found (.457; p= 0.010) no correlation found with headache duration. A moderate relationship was found between questionnaires. Both should be used for patients with SH. It is possible that individual variability in sinus symptoms versus headache symptoms may impact QL differently. The self-reported nature of the SH may have impacted results.

◆ 76 G ◆

Relationship between strength measures of selected intrinsic muscles of the foot and the dynamic stiffness of the arch during gait

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The plantar intrinsic muscles support the foot during the stance phase of the gait cycle as one of their roles is to contract to help control the deformation of the longitudinal arch. A reduction in longitudinal arch stiffness (more deformation of the arch during gait) has played a role in plantar fasciitis, knee osteoarthritis, tibialis posterior tendinopathy, and metatarsal stress fractures. Weakness of the plantar intrinsic muscles has also been implicated in different pathologies such as claw toes and hallux valgus. The purpose of this study was to see if the strength of selected intrinsic muscles of the plantar foot correlate to the dynamic stiffness of the foot. To evaluate any possible correlations between muscle strength and longitudinal arch stiffness, the three plantar intrinsic muscles we evaluated were: flexor hallucis brevis (FHB), flexor digitorum brevis (FDB), and quadratus plantae (QP). We collected data on twenty-three (23) healthy asymptomatic adults, using a free hand ultrasound probe to image the short axis of the FHB, FDB, and QP muscles to calculate their Physiological Cross-Sectional Area PCSA (reflecting strength). The dynamic Longitudinal Arch stiffness (DLAS) was measured as the ratio of load and arch deformation during the stance phase of gait. The association between PCSA and DLAS normalized to foot size and walking speed (respectively) will be evaluated using the Pearson Product-Moment

Correlation. These findings could lead towards broadening treatment advancements for foot conditions/ pathologies that could benefit from intrinsic foot muscle strengthening.

◆ 77 G ◆

Asymmetry in runners with unilateral valgus-related conditions

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Asymmetry is used to determine treatment, but specific patterns have not been described. To describe asymmetry in individuals with unilateral valgus-related conditions. 24 runners (13 males, 11 females) ran on a treadmill where video captured: contralateral pelvic drop (CPD), upper trunk rotation (UTR), base of gait (BOG), and tibial inclination (TI); inertial measurement units were used to measure: contact time (CT), pronation excursion (PE) and velocity (PV), foot strike type (FST), and foot acceleration (reactive forces). Asymmetry was calculated using the symmetry index, where a difference greater than 15% was considered significant, and reported for the total sample (n=24) and per condition: Achilles tendinopathy (n=5), medial tibial stress syndrome (n=2), plantar heel pain (n=3), and anterior knee pain (n=14). The association between variables was examined using bivariate correlations. 63% of individuals had a significant asymmetry in PE, with more pronation in the involved limb; and 70% of individuals had asymmetry in CPD, that occurred at a similar frequency between the involved and uninvolved limb. 95% of individuals had an asymmetry in BOG, with a narrower BOG on the involved side. Individuals with anterior knee pain had asymmetry in UTR (64%), BOG (100%), and TI (64%), without a clear trend of greater magnitude in the involved or uninvolved limb. Moderate correlations were observed between PE and CT, shock and FST, and TI and shock. Asymmetry patterns were observed in valgus-related conditions including minor differences between conditions. Further research is needed with larger sample sizes to corroborate these preliminary findings.

◆ 78 G ◆

Association of medial longitudinal arch stiffness with fifth metatarsal base external torque during gait and cross cuts. implications to Jones Fracture.

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The Jones Fracture is common to athletes because of the proposed mechanics of injury. Adding to the issue, is the difficulty for the fracture to heal because of the anatomy. The Jones fracture is defined as a transverse fracture, at the proximal fifth metatarsal, and at the metaphyseal-diaphyseal junction. The blood supply to the metaphyseal-diaphyseal zone occurs via a nutrient artery entering the proximal diaphysis. It extends proximally into the metaphyseal-diaphyseal space. A Jones Fracture affects the retrograde travel of the nutrient artery, thus leading to a watershed zone. The purpose of this study is to assess the correlation between the medial foot arch and torque at the 5th metatarsal base during gait and cross cuttings. We hypothesize greater torque at the 5th metatarsal base during crosscut than gait, and that individuals with a high medial foot arch will have greater torque at the 5th metatarsal base during a cross-cut, thus making the foot with a high medial arch prone to a Jones Fracture. The goal of this study is to increase knowledge for Jones Fracture and associated risk factors. This can increase awareness and prophylaxis care for patients. We plan to enroll 60 subjects with an equal distribution of the three foot types. The peak torque developed around the 5th metatarsal base during these tasks will be determined. The preliminary results show a trend of an increasing peak torque going from flexible to rigid feet during a crosscut maneuver on the 5th metatarsal when compared to walking.

◆ 79 U ◆

Wastewater surveillance for infectious disease: a systematic review

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Wastewater surveillance of SARS-CoV-2 has shown to be a valuable source of information regarding SARS-CoV-2 transmission and COVID-19 cases. Though the method has been used for several decades to track other infectious diseases, there has not been a comprehensive review outlining all of the pathogens surveilled through wastewater. The aim of this study is to identify what infectious diseases have been previously studied via wastewater surveillance prior to the COVID-19 Pandemic and identify common characteristics between the studies, as well as identify current gaps in knowledge. Peer-reviewed articles published as of August 1, 2020 that examined wastewater for communicable and infectious human pathogens on 2 or more occasions were included in the study. Excluded from this list were all reviews and methods papers, single collection studies, and non-human pathogens. Infectious diseases and pathogens were identified in studies of wastewater surveillance, as well as themes of how wastewater surveillance and other measures of disease transmission were linked. This review did not include any numerical data from individual studies and thus no statistical analysis was done. 1005 articles were identified but only 100 were included in this review after applying the inclusion criteria. These studies came from 38 countries with concentration in certain countries including Italy, Israel, Brazil, Japan, and China. Twenty-five separate pathogen families were identified in the included studies, with the majority of studies examining pathogens from the family Picornaviridae, including polio and non-polio enteroviruses. Most studies of wastewater surveillance did not link what was found in the wastewater to other measures of disease transmission. Among those studies that did compare wastewater surveillance to other measures of disease transmission the value observed was dependent upon pathogen and varied by study. Wastewater surveillance has historically been used to assess water-borne and fecal-orally transmitted pathogens causing diarrheal disease. However, numerous other types of pathogens have been surveilled using wastewater and wastewater surveillance should be considered as a potential tool for many infectious diseases. Wastewater surveillance studies can be improved by incorporating other measures of disease transmission at the population-level including disease incidence and hospitalizations.

◆ 80 G ◆

Racial-ethnic differences in off-label antipsychotic medication use among community-dwelling adults, 2001-2018

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The use of antipsychotics medications without U.S. Food and Drug Administration approval (referred to as an off-label use) may have potential health risks. Yet, little has been documented regarding whether and how off-label antipsychotic use is related to patients' race and ethnicity, particularly among the community-based antipsychotic drug users. The purpose of this study is to determine how often antipsychotics are prescribed off-label and whether off-label uses differ between racial/ethnic minorities among community dwelling U.S. adults. Using Medical Expenditure Panel Survey data from 2001 through 2018, this study identified community-dwelling U.S. adults aged 18 or older who had filled antipsychotic drugs prescriptions (N=7,583). Self-reported medical conditions files were used to identify off-label antipsychotic medications users. Multivariate logistic and negative binomial regressions were performed for the likelihood and frequency analysis, respectively. During 2001-2018, this study reported that about two-thirds (65%) of antipsychotic drugs were used for off-label indications. Both Blacks and Hispanics were significantly more likely than Whites to use off-label antipsychotics (Adjusted Odds Ratio [AOR]=1.26 for Blacks and AOR=1.42 for Hispanics). Once off-label treatments were initiated, however, no racial differences were found in the total number of off-label prescription fills between any racial groups. Off-label antipsychotic use is common, particularly among the racial/ethnic minority groups. Given that these medications have greater potential risks and are disproportionately expensive, further assessments, which include monitoring evidence-based antipsychotic uses, are recommended.

◆ 81 G ◆

Queer in the heartland: predictors of empirically derived substance use patterns

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Substance use patterns remain largely unknown for subgroups of sexual and gender minority (SGM) populations, such as bisexual and genderqueer individuals living in the Midwest. The aims of this study were to (1) identify latent classes of substance use behaviors among a sample of SGM adults living in a predominantly rural U.S. state and (2) determine the association between SGM-related discrimination and the empirically-derived substance use classes. We conducted a latent class analysis on 494 responses to a state-wide survey, followed by a multinomial logistic regression to test predictors of class membership, including distal experiences of discrimination and sociodemographic variables. A 3-class model fit best and included polysubstance use (15.3%), binge drinking (21.5%), and no/low use (63.1%) classes. In the adjusted model, polysubstance class membership was positively associated with cisgender male identity (adjusted odds ratio [AOR]=2.23; 95% CI:1.10-4.54) and negatively associated with being 60 years of age or older (AOR=0.27; 95% CI:0.10-0.68) and college educated (AOR=0.40; 95% CI:0.22-0.72). Binge drinking class membership was negatively associated with bisexual/pansexual identity (AOR=0.46; 95% CI:0.22-0.96) and non-white race/ethnicity (AOR=0.36; 95% CI: 0.15-0.87). In contrast to hypothesized outcomes guided by the minority stress model, experiences of discrimination were not associated with any substance use class membership. Likewise, bisexual/pansexual individuals were not more likely to be members of polysubstance use or binge drinking classes despite published reports of greater risk of substance use. These contradictions warrant intersectional approaches to further substance use research which may provide important evidence for targeted prevention/treatment interventions, particularly among polysubstance users.

◆ 82 G ◆

The association between patient's race and ethnicity and the use of first versus second generation antipsychotics among community-dwelling adults in the U.S.

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First-generation antipsychotics (FGA) are associated with higher health risks and more adverse effects than second-generation antipsychotics (SGA). Given that racial minority groups tend to receive less evidence-based pharmaceutical care, patients' race-ethnicity may influence the use of FGA vs SGA. However, little is known about such relationship, particularly in the community-based setting. The aim of this study was to examine the prevalence and the frequency of FGA use compared to SGAs by patients' race-ethnicity among community-dwelling U.S. adults. Multiyear data (2006-2018) from the Medical Expenditure Panel Surveys were used. The sample includes community-dwelling U.S. adults aged 18 or older who received antipsychotic prescription during the survey years (N=5,369). The use of FGA vs SGA was identified using generic names of the drugs. Multivariate logistic and negative binomial regressions were performed for the likelihood and frequency analysis, respectively. The likelihood of filling FGA was higher among Blacks (compared to Whites) (Adjusted Odds Ratio=1.38; p-value=0.024). No significant difference was found in FGA use between Whites and Hispanics. The frequency analysis, however, showed that Hispanics used significantly fewer FGA (compared to Whites) once they initiated FGA treatment (Incidence Rate Ratio=0.72; p-value=0.009). Blacks were more likely than whites to fill FGA prescriptions, indicating that there may be racial disparities in the quality of antipsychotic care. This suggests the need for special attention to the type of medication use and more evidence-based care among racial minority groups to mitigate differential quality of care.

◆ 83 G ◆

Literature review: understanding mask non-adherence during COVID-19 pandemic

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There has been mask wearing hesitancy during the COVID-19 pandemic. As mask mandates are changing, we want to learn more about how to navigate future pandemics. To explore current studies that describe reasons why someone might be hesitant to wear masks. Will identify themes and provide advice on how to effectively communicate with patients to increase mask adherence for current and future pandemics. A literature research using Pubmed was conducted from December 2020 to February 2021. Inclusion criteria included:(((coronavirus OR "corona virus" OR coronavirinae OR coronaviridae OR betacoronavirus OR covid19 OR "covid 19" OR nCoV OR "CoV 2" OR CoV2 OR sarscov2 OR 2019nCoV OR "novel CoV" OR "wuhan virus") OR ((wuhan OR hubei OR huanan) AND ("severe acute respiratory" OR

pneumonia) AND (outbreak)) OR "Coronavirus"[Mesh] OR "Coronavirus Infections"[Mesh] OR "COVID-19" [Supplementary Concept] OR "severe acute respiratory syndrome coronavirus 2" [Supplementary Concept] OR "Betacoronavirus"[Mesh]) AND ("anti mask" OR mask* OR "face shield" OR "face covering")) AND (motivation OR "social behavior" OR adherence OR compliance)Outcomes: 57 articles were generated. 16 were excluded. Literature suggested there are two large categories pertaining to mask adherence: modifiable and non-modifiable factors. Modifiable risk factors include risk perception, perceived comfort, peer groups, and political affiliation. Non-modifiable risk factors include SES, educational status, gender norms and stigmatization. We want to effectively target these modifiable factors in patient-physician conversations to increase mask adherence during pandemics.

◆ 84 G ◆

Nationwide comparative analysis of COVID-19 vaccine adverse events using Vaccine Adverse Events Reporting System

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The emergency use authorization and implementation of newly created SARS-CoV2 vaccines in the US has contributed towards controlling the spread of the COVID-19 pandemic. Issues surrounding side effects, distribution, vaccine hesitancy, and emerging viral strains remain barriers to ending the pandemic. This project aims to elucidate the geographic patterns of adverse event rates, both severe and otherwise, among the three vaccines widely available in the US (Moderna, Pfizer, Johnson & Johnson) to serve future public health and policy interventions. This project serves as an extension of our previous analysis of the geographic patterns of COVID-19 vaccine adverse events. Data was collected from the Vaccine Adverse Event Reporting Database (VAERS) provided by the Centers for Disease Control and Prevention (CDC) and the Food and Drug Administration (FDA). This data was subsequently cleaned, standardized, analyzed via SAS and R-Studio statistical programs, and mapped through ArcMap software. Observational and comparative statistical analyses were then performed to study state and national level data regarding adverse events among the three vaccines. There were no statistically significant differences between states when narrowing to severe adverse reactions among the three vaccines, with severe adverse events occurring at a national average of 8 per 10,000 vaccines distributed. Moderna (43%) and Pfizer (35%) vaccines had higher proportions of adverse events compared to Johnson and Johnson (20%). Overall, geography doesn't appear to be a determining factor of vaccine adverse effects, and additional research needs to be done to understand the geographic factors behind vaccine side effects.

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Calmodulin availability regulates basal autophagy

Elizabeth McConnaha¹, MS, PhD'25, Jennifer Giles¹, MA, Eric Wauson¹, PhD, and Quang-Kim Tran¹, MD, PhD

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Autophagy is a process by which cells degrade damaged or unutilized proteins or organelles to maintain homeostasis. In the final step of autophagy, cells utilize lysosomal degradative enzymes to breakdown unwanted macromolecules. To maintain lysosomal enzyme functions, an acidic lysosomal pH must be conserved. In autophagy, intracellular calcium has been shown to play important roles. Calmodulin (CaM) is the key transducer of intracellular calcium signaling by binding with a large network of CaM-binding proteins. However, calmodulin is not expressed sufficiently for its target proteins, generating a limiting condition in which calmodulin availability is competed for and as such regulates cell functions. Although several CaM-binding proteins have been implicated in autophagy, there is no investigation on the correlation between CaM availability and the regulation of autophagy, especially in basal condition when there are no stimulated increases in intracellular calcium. Here we show how CaM availability plays a role in the regulation of basal autophagy. In C1293 cells, a monoclonal stable cell line that overexpresses CaM, autophagic flux was significantly increased at the basal state when compared to the wildtype counterpart HEK293 cells. During amino acid starvation, the C1293 cells maintained the elevated autophagic flux. By inhibiting CaM with various CaM antagonists or buffering CaM using a very high-affinity CaM binding protein, we show decreased CaM availability alkalinizes basal lysosomal pH. This pH change was demonstrated using LysoTracker Green or LysoSensor Yellow/Blue. Taken together, CaM availability aids in maintaining a functional lysosome, which contributes to the regulation of basal autophagy.

Validation of the foot arch stiffness measurement in healthy non-symptomatic adults

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Foot arch stiffness has been mentioned extensively in literature since it provides several clinical applications in podiatric medicine. The foot arch stiffness measurement – Arch Stiffness Index (ASI) reflects the arch deformation of the foot under different load conditions as shown by the Arch Height Index (AHI). The static ASI was developed on an assumption of body weight (BW) distribution on each foot: 10% BW in seated and 50% BW in standing position. However, since 2016, the accuracy of this BW distribution has been challenged. The aim of this study was to evaluate the concurrent validity (criterion based) of this static ASI measurement. Sixty-two (62) non-symptomatic healthy adults participated in the study. The ASI was simultaneously evaluated using the assumed 40% BW difference and the actual load under the foot using in ground imbedded force plates. The AHI was assessed using the 3D position of foot markers on the heel, the navicular, and the head of the first metatarsal bone. The 50% BW assumption during standing was accurate, however, the 10% BW load in the seated position was an overestimate ($1.8 \pm 2.8\%$, $p < 0.001$). Excellent concurrent validity was found in the static ASI measurement, with intraclass correlation coefficient (ICC_{2,1}) of 0.982 (0.971 to 0.990, 95% CI). It was also found that using a 40% BW distribution difference systematically underestimated the ASI by $3.8 \pm 8.3\%$. Non-withstanding this systematic bias the static ASI can be used with confidence for foot arch stiffness longitudinal assessment.

NMDA receptor modulation in protracted ethanol withdrawal

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Functional dysregulation of the glutamate system during withdrawal from chronic drug exposure is a primary driver of drug craving and relapse. Animal models of psychostimulant use have demonstrated dynamic alterations in NMDA receptor function and expression that contribute to drug seeking behavior. These changes begin as early as 5 days following

cessation of drug use are persistently expressed into long term withdrawal (>60d). Evidence of NMDA receptor dependent changes during short term withdrawal (24h) suggest that similar mechanisms may drive drug craving and relapse behaviors following chronic exposure to ethanol. To this end, we investigated NMDA receptor protein and surface expression during protracted withdrawal from chronic intermittent ethanol (CIE) exposure using western blot. We focused on the basolateral amygdala (BLA), as glutamatergic signaling in this region is robustly modulated by short term (24h) withdrawal from CIE (10d, 12hr/day) and regulates anxiety-like behavior expressed during withdrawal. Adolescent male rats were exposed to repeated cycles of CIE (12hr/day, 4d on/3d off, 3 cycles) and brain tissue was collected during protracted withdrawal. Optimization of experimental procedures is currently being conducted and analysis of total and membrane surface expression will be analyzed by surface biotinylation for NMDAR subunits (GluN1, GluN2B, GluN3). Cell surface biotinylation will be used to isolate cell surface membrane proteins to detect and quantify expression of NMDAR subunits. We expect to identify an increase in membrane surface expression for NMDAR subunits, in agreement with functional data obtained in the laboratory.

◆ 1:53 pm G ◆

Reasons for COVID-19 vaccine hesitancy primarily among the Medicare population, associated disparities and methods to address the gap in vaccination rates

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As one of the first eligible groups for the COVID-19 vaccine, it is important to understand reasons for vaccine hesitancy among the Medicare population, disparities that exist within subgroups, and methods to address the gaps in vaccination rates. A review was conducted of studies published from October 2020 to February 2021 in EBSCOHost, Google scholar, ProQuest, Scopus, and PubMed using key word searches of "COVID", "65 and older", "Medicare", "willingness", "encourage", "hesitancy" and "CMS" to identify the literature. A final pool of 15 articles were selected and analyzed. In general, adults ages 65 and older are the most willing to vaccinate compared to other ages. Furthermore, COVID-19 had a higher willingness to get vaccinated than other outbreaks such as the 2009 H1N1 and the 2016 Zika virus pandemic. Some of the top identified reasons for vaccine hesitancy included: not believing the COVID-19 vaccine would give necessary immunity; potential side effects of the vaccine; antivaccination beliefs, attitudes, and emotions; perceived barriers like fear of getting sick, lack of time, and cost; and skepticism about speedy development of COVID-19 vaccines. When considering demographic factors, 26.8% of Black participants were not willing to get vaccinated compared to 8% of white respondents. Women (12.1%) were more hesitant than men (5.7%). Those with higher income and education were associated with increased willingness. Interventions and methods to address the gap in vaccine rates should focus on acknowledging hesitancy and exploring the beliefs and attitudes regarding COVID-19 in respectful, sustained, and open communications.

◆ 2:30 pm G ◆

Potential renoprotective effects of chronic remote ischemic conditioning in a rodent model of sleep apnea

Benjamin G. Madigan, DO'24², Katherine Harbeck, DO'24², Raina Gerrits, DO'24², Kalie A. Savage, DO'23², Sarah C. Clayton, PhD¹, Kiefer W. Kious, MS¹, Kelsey S. Schwartz, BS³, James A. Lang, PhD³, Noah J. Marcus, PhD¹

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Remote ischemic conditioning (RIC) is the application of intermittent ischemia to an extremity with the intent of protecting a distant organ from subsequent ischemic insults. RIC has been shown to have renoprotective effects in acute settings, however the benefits of RIC in treating chronic illnesses is unknown. Sleep apnea (SA) is a highly prevalent disorder that is associated with chronic kidney disease; therefore, SA patients may benefit from the renoprotective effects of RIC. We hypothesized that the application of RIC in a rodent model of SA (chronic intermittent hypoxia, CIH) would have beneficial effects on the regulation of renal hemodynamics and prevent inflammation, oxidative stress, and pro-fibrotic signaling. Adult male Sprague Dawley rats were exposed to CIH or sham for 14 days; two sub-groups (n=6 per group) received RIC every 48 hours over the final 7 days. Renal perfusion and PO₂ were measured at baseline and in response to hypoxia. Cortical tissue was assessed for gene expression related to inflammation, oxidative stress, and fibrosis using qRT-PCR.

CIH resulted in baseline reductions in renal blood flow and PO₂ relative to sham in addition to greater hypoxia-evoked reductions in these measures ($p < 0.05$). No differences were observed in renal blood flow/perfusion or PO₂ between RIC-AIR and RIC-CIH groups ($p > 0.05$). Cortical expression of IL-6, IL-1 β , CuZn-SOD, and Collagen III were increased in CIH vs. sham ($p < 0.05$), whereas no differences in expression were observed between RIC-AIR and RIC-CIH groups ($p > 0.05$). These results suggest RIC may confer a salutary effect on renal physiology with exposure to CIH.

◆ 2:38 pm G ◆

Medial orbital floor thickness and asymmetry: implications for blow-out fractures

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Studies on blow-out fractures point to the relevance of orbital floor thickness, with some indicating thinner floors medially. However, previous studies are limited by small samples of homogenous populations. Although the assumption is right and left sides are symmetrical, most studies are unilateral. Our study uses CT scans of modern human crania across a geographically diverse sample ($n=56$) with bilaterally intact orbital floors. Orbital thickness data was collected to examine for differences between medial and lateral thicknesses bilaterally (e.g., medial thickness right vs. left). Using 3DSlicer, orbital thickness was taken medially and laterally relative to the infraorbital canal at 0, 1, and 2mm positions, starting directly at the first visible instance of the posterior aspect of the infraorbital canal. Wilcoxon sign ranked testing was used to compare right- versus left-sided thicknesses at each position. Data yielded statistically significant differences in right versus left sides for all positions of the medial thicknesses, including average medial thickness (all p -values < 0.05); no significant differences were found for lateral thicknesses (all p -values > 0.05). This suggests orbital floor medial thickness is asymmetrical. Blow-out fracture literature implicates thin orbital floors in the pathogenesis of medial and lateral fractures. Current surgical management of orbital fractures involves placement of an implant at the fracture site, which can be molded depending on its composition. Although reconstruction is typically done based on the un-affected side, asymmetry may be a negative factor. We aim to provide more anatomical data to the surgical repair of orbital fractures.

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