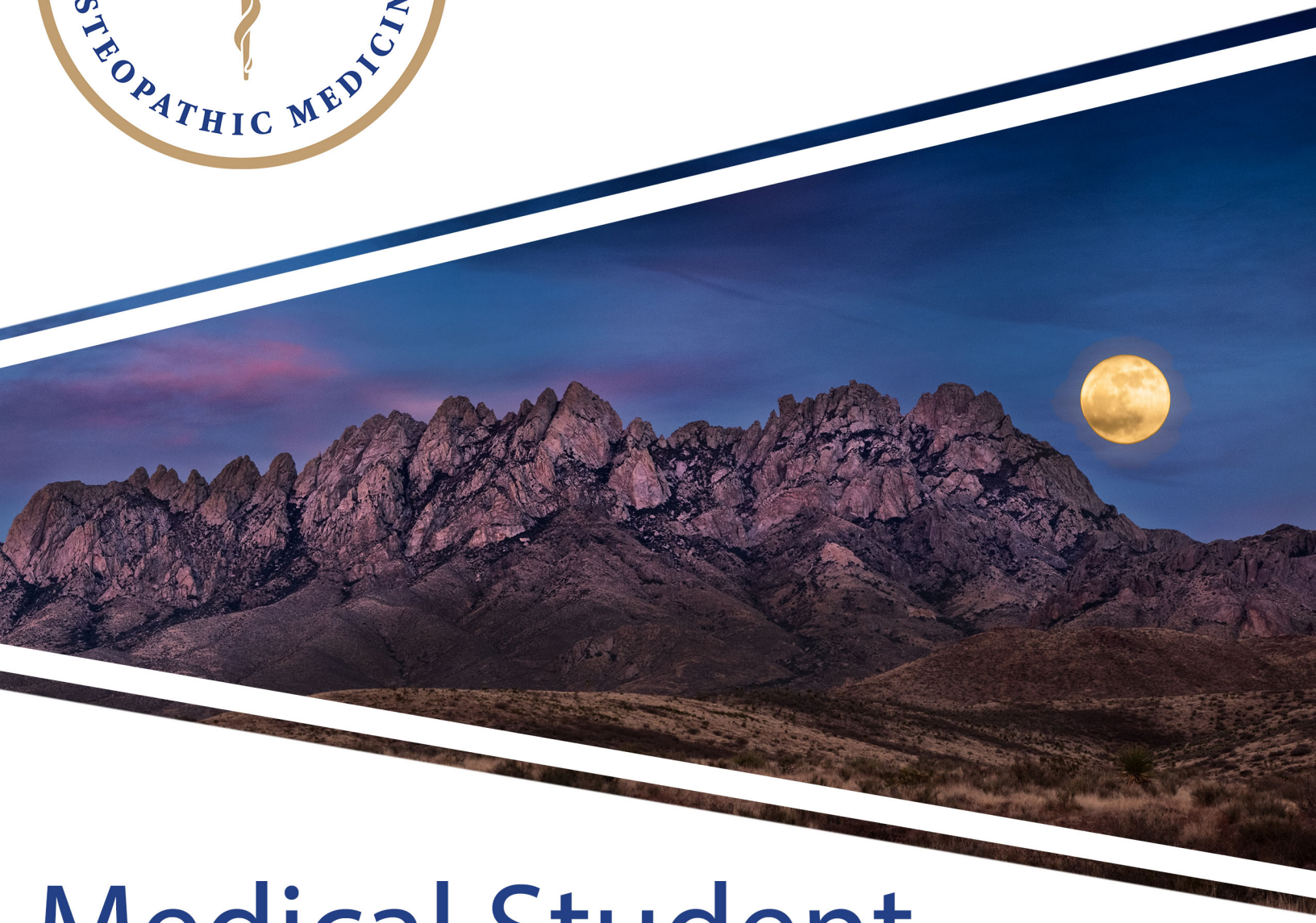
July 17, 2020



Medical Student Research Day 2020

Burrell College of Osteopathic Medicine
3501 Arrowhead Dr., Las Cruces, NM 88001
www.bcomnm.org

This year's cover was designed by videographer Christopher Espinosa. It features a super moon over the Organ Mountains. With an elevation of 9,000 feet, this jagged mountain range sits as a backdrop to Burrell College and the city of Las Cruces, New Mexico. President Barack Obama designated the Organ Mountains–Desert Peaks a national monument in 2014, permanently protecting more than 496,000 acres of land to preserve the prehistoric, historic and scientific values of the area. Many students and faculty have hiked the range for recreation during their time at the college—and many more will in years to come.

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Burrell College of Osteopathic Medicine
3rd Annual Medical Student Research Day 2020

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DIRECTOR OF STUDENT RESEARCH WELCOME LETTER

It is with great pleasure that I welcome you to the much anticipated 3rd Annual Medical Student Research Day! This year, and to keep with our annual tradition, I welcome everyone to our first-ever virtual event, which demonstrates our commitment to celebrating student research and creative scholarship achievements by providing an opportunity for students to present their fascinating work. I thank our visitors and participants for helping make Medical Student Research Day an exciting and memorable event as we enthusiastically honor our medical students and their mentors.

I am pleased to announce that a total of thirty-two (32) abstracts and presentations were submitted for the following research areas: biomedical sciences, clinical sciences and OMT, and population and public health research. I am also pleased to announce that the 2020 Summer Research Experience, a 6-week summer research opportunity that is designed for students to participate in faculty-mentored research, involved forty-two (42) students and fifteen (15) Burrell College faculty this year alone, and culminates today with twenty (20) student presentations.

Due to the current challenges we are experiencing, Medical Student Research Day has adopted a virtual format; therefore, students are presenting their research projects through 10-minute oral presentations, which will be judged by a review panel. Exceptional research presentations will be honored during an awards ceremony that will occur during the beginning of the academic school year.

Within this event program, you will find abstracts organized by research areas that illustrate the research and creative scholarship undertakings of our medical student researchers and their respective mentors. Also included are the schedule of events, judging information, and a biographical sketch of our keynote speaker.

We are honored to welcome Dr. Tom Yorio, Ph.D., from UNT Health Sciences Center as today's keynote speaker. Dr. Yorio is a professor of Pharmacology and Neuroscience, and the North Texas Eye Research Institute. We would especially like to thank Dr. Yorio for agreeing to speak today.

Again, thank you for joining us today to make our Medical Student Research Day a memorable one. I hope you enjoy this year's event and hope to see you next year.

Wishing you every success,

Steven J. Ontiveros, M.B.A., Ph.D.
Associate Professor of Anatomy & Cell Biology
Director of Student Research
MSRD Event Director

MESSAGE FROM THE ASSISTANT DEAN FOR RESEARCH

On behalf of the Office of Research and the Summer Research Experience Program faculty, I wish to offer congratulations to all of our student presenters. In addition, I wish to thank the program faculty for their creativity and willingness to mentor high quality research projects during a pandemic. We would not have today's event without your commitment. You should all be proud of the accomplishments that are showcased in our 3rd Annual Research Day.

One of our goals for this year was to incorporate Responsible Conduct of Research education throughout the six-week experience. I wish to acknowledge the efforts of Drs. Ontiveros, Jackson, Stauss, and Szalai for their contributions in development, implementation, and delivery of a weekly series that at focused on publication and presentation of scientific data.

I also wish to thank the members of the Office of Research who went to extremes to ensure that research could continue this summer. Ms. Martha Enrinquez facilitated communication in the telework environment, kept our supply lines open, and provided support for our Institutional Review Board, Institutional Biosafety Committee, and Research Advisory Council. Dr. Woods and Ms. Kalli Martinez kept our BioScience Research Laboratory operational so that faculty could continue to access the laboratory throughout the summer. Finally, I wish to acknowledge the efforts of our Director of Student Research, Dr. Ontiveros, for organizing and shepherding an online Summer Research Experience and Medical Student Research Day.

The abstracts contained in this program summarize the accomplishments of our student researchers and their mentors. Moreover, today's event exemplifies the dedication, innovation and commitment of the Burrell College family to sustaining research and creative scholarship during challenging times. I hope that you enjoy the presentations that our students have developed and encourage you to interact with our presenters during the discussion periods and in the future.

Joseph N. Benoit, Ph.D.
Assistant Dean for Research
Professor of Physiology & Pathology
Email: Research@bcomNM.org

SCHEDULE OF EVENTS

3rd Annual Medical Student Research Day

July 17, 2020

Program Schedule

Welcome Remarks	8:00 – 8:15 AM	Dr. Don Peska, Dean & CAO, Burrell College Dr. Joseph Benoit, Assistant Dean for Research Dr. Steven J. Ontiveros, Director of Student Research

Concurrent Session #1

Period A1 - Clinical & OMT Research

SEQUENCE NO.	TIME	ABSTRACT NUMBER	PRESENTATION TITLE
1	8:15 AM	201S	OCCIPITO-ATLANTAL DECOMPRESSION AND TRANSCUTANEOUS AURICULAR VAGUS STIMULATION SLOWS CONDUCTION VELOCITY THROUGH THE ATRIOVENTRICULAR NODE Dalgleish AS[1], Kania AM[2], Stauss HM[3], Jelen A[1] Class of 2023 (equal contribution)[1];Departments of Clinical Medicine[2] and Biomedical Sciences[3], Burrell College of Osteopathic Medicine, Las Cruces, NM
2	8:25 AM	202S	NON-FRUCTOSE BASED BEVERAGES: ASSESSMENT ON PROGRESSION OF METABOLIC SYNDROME Murnin J[1] , Mwangi V[1] , Selinfreund R[1] , Breslin P[2] Burrell College of Osteopathic Medicine, Las Cruces, NM[1] ; Monell Chemical Senses Center, Philadelphia, PA Rutgers University Department of Nutritional Sciences, New Brunswick, NJ[2]
3	8:35 AM	203S	SPLENIC PUMP CHANGES CIRCULATING IMMUNE CELL PROFILE LEADING TO ALTERED CYTOKINE RESPONSES TO INFLAMMATORY STIMULI Daggett J[1], Shankey M[1], Horvath M[1], Kania A[2], Stauss HM[3], Szalai G[3] [1]Burrell College of Osteopathic Medicine Class of 2023, equal contributors; [2]Burrell College of Osteopathic Medicine, Department of Clinical Medicine; 3Burrell College of Osteopathic Medicine Department of Biomedical Sciences
4	8:45 AM	204S	USING FORCE SENSORS TO ESTABLISH CLINICAL GUIDELINES FOR THE ABDOMINAL PALPATION EXAM Jezulin DC[1], Kania AM[2], Chang V[2] [1]Burrell College of Osteopathic Medicine Class of 2023; [2]Burrell College of Osteopathic Medicine, Department of Clinical Medicine

5	8:55 AM	205S	STANDARDIZING STERNOCLEIDOMASTOID MUSCLE SURFACE EMG MONITORING FOR ENERGY LOADING AND ELECTRICAL ACTIVITY ANALYSIS Aluri BC, Perdomo JE, Chang V[1], Vaudrey K[2], Jackson J[2] [1]Department of Clinical Medicine, Burrell College of Osteopathic Medicine, Las Cruces, NM 88001; [2]Department of Anatomy and Cell Biology, Burrell College of Osteopathic Medicine, Las Cruces, NM 88001
Q/A #1	9:05 - 9:25 AM		Panel Discussion

Period B1 - Population and Public Health Research

SEQUENCE NO.	TIME	ABSTRACT NUMBER	PRESENTATION TITLE
6	9:25 AM	301S	MATERNAL IODINE STATUS INFLUENCING FETAL HEALTH AND ADVERSE BIRTH OUTCOMES IN THE NAVAJO BIRTH COHORT STUDY (NBCS) Mogilevsky R[1], Luo L[2], Hoover J[2], MacKenzie D[2], De La Rosa V[1] [1]Department of Biomedical Sciences, Burrell College of Osteopathic Medicine, Las Cruces, NM 88001; [2]Community Environmental Health Program, College of Pharmacy, University of New Mexico, Albuquerque, NM 87106
7	9:35 AM	302S	CANCER PREVENTION IN THE PASO DEL NORTE REGION: ASSESSING HPV KNOWLEDGE AND VACCINATION RATES IN A MAJORITY HISPANIC COMMUNITY Chidi C[1], Muniz L[1], Frietze GA[2], Padilla ME[2], Moya EM[3], Gosselink KL[1] [1]Department of Physiology and Pathology, Burrell College of Osteopathic Medicine, 3501 Arrowhead Drive, Las Cruces, NM, 88001;[2]School of Pharmacy, The University of Texas at El Paso, 500 West University Avenue, El Paso, TX, 79968; 3Department of Social Work, The University of Texas at El Paso, 500 West University Avenue, El Paso, TX, 79968
8	9:45 AM	303S	A PROPOSED STUDY TO INVESTIGATE THE EFFECTS OF COVID-19 QUARANTINE ORDERS ON COMMUNITY HOSPITAL EMERGENCY DEPARTMENT USAGE IN NEW MEXICO Lee SH*, Germaine C*, Alonzo MA, Good Z, Grayeb D, Hochstein B, Hayes O, and Woods ME Department of Physiology and Pathology, Burrell College of Osteopathic Medicine, Las Cruces, NM 88001
9	9:55 AM	304S	DO SOCIAL DETERMINANTS PLACE BARRIERS ON MEDICAL SCHOOL MATRICULANTS?

			Tavarez MS, Aluri BC, Perdomo JE, Jackson J1 Department of Anatomy and Cell Biology, Burrell College of Osteopathic Medicine, Las Cruces, NM 88001
10	10:05 AM	305S	SHORT-TERM TRIAGE AND LONG-TERM PLANNING IN ADDRESSING RECURRENT CYCLES OF INFECTIOUS DISEASE AMONG NEW MEXICO'S NATIVE COMMUNITIES: LESSONS FROM COVID-19 Barragan-Lopez,V[1], Bennett S[1], Gallegos S[1], Martinez-Moad M[1], Varatharaj S[1], Lente A[2], McHorse J[3], Minugh-Purvis N[4] [1]Class of 2023; 2Department of Clinical Medicine, [3]Office of Enrollment Services, and [4]Dept. of Anatomy and Cell Biology; Burrell College of Osteopathic Medicine, Las Cruces, NM 88001
11	10:15 AM	306S	COVID-19 AND CHILDREN: POSSIBLE EXPLANATIONS AS TO WHY CHILDREN HAVE AVOIDED SEVERE COMPLICATIONS Syme KJ, Bramblett DE Department of Biomedical Sciences, Burrell College of Osteopathic Medicine, Las Cruces, NM 88001
Q/A #2	10:25 - 10:45 AM		Panel Discussion
Coffee Break	10:45 - 11:00 AM		

Period C1 - Biomedical Research 1

SEQUENCE NO.	TIME	ABSTRACT NUMBER	PRESENTATION TITLE
12	11:00 AM	101S	VIABILITY OF CLOTRIMAZOLE AND RESVERATROL FOR COMBINATORIAL CANCER THERAPY Ablao RM*, Farhad R*, Gallegos SA*, and Ontiveros SJ Department of Anatomy and Cell Biology, Burrell College of Osteopathic Medicine, Las Cruces, NM, 88001 *Authors contributed equally
13	11:10 AM	102S	CIRCADIAN INFLUENCES ON HYPERTENSIVE RESPONSES TO STRESS Department of Physiology and Pathology, Burrell College of Osteopathic Medicine, 3501 Arrowhead Drive, Las Cruces, NM, 88001
14	11:20 AM	103S	THE EFFECTS OF CANNABIDIOL ON NEUTROPHIL EXTRACELLULAR TRAP (NET) FORMATION Alonzo MA*, Hochstein B*, and Woods ME Department of Physiology and Pathology, Burrell College of Osteopathic Medicine, Las Cruces, NM 88001

15	11:30 AM	105S	INCREMENTAL EXERCISE BLOOD PRESSURE AND CLUCOCORTICOID SENSITIVITY Puentes H, Ellen C, Del Corral P Burrell College of Osteopathic Medicine, Las Cruces, NM
Q/A #3	11:40 - 12:00 PM		Panel Discussion
Lunch	12:00 - 12:30 PM		
Keynote	12:30 - 1:30 PM		

Period D1 - Biomedical Research 2

SEQUENCE NO.	TIME	ABSTRACT NUMBER	PRESENTATION TITLE
16	1:40 PM	104S	EXERCISE INDUCED HYPOTENSION AND GLUCOCORTICOID SENSITIVITY Del Corral P, Ali S, Brown K, Rodriguez S Department of Physiology and Pathology, Burrell College of Osteopathic Medicine, Las Cruces, NM 88001
17	1:50 PM	106S	INVESTIGATING THE EFFECTS OF OLEOCANTHAL ON IN VITRO NEUTROPHIL EXTRACELLULAR TRAP FORMATION AND POSSIBLE LINKS TO AUTOIMMUNE AND INFLAMMATORY DISEASE Woods ME, Grayeb DR, and Good Z Department of Physiology and Pathology, Burrell College of Osteopathic Medicine, Las Cruces, NM 88011
18	2:00 PM	107S	OPTIMIZATION OF RT-LAMP ASSAY FOR ZIKA VIRUS Hughes R, Sufyan M, Bramblett D, and Woods M Department of Microbiology, Burrell College of Osteopathic Medicine, Las Cruces, NM
19	2:10 PM	108S	PRIMO-VASCULAR SYSTEM: A PARADIGM SHIFT FOR OSTEOPATHIC MANIPULATIVE TREATMENT Herber A[1], McLeod N[1], Minugh-Purvis N[2], and Ontiveros SJ[2] Class of 2023[1] and Department of Anatomy and Cell Biology[2]; Burrell College of Osteopathic Medicine, Las Cruces, NM 88001
20	2:20 PM	109S	WHAT'S IN THE SOUP? ADVENTURES IN METHODOLOGY FOR QUALITATIVE ANALYSIS OF CADAVER EMBALMING REACTION PRODUCTS ENCOUNTERED DURING HUMAN DONOR DISSECTION Yano K and Jackson J Burrell College of Osteopathic Medicine, Las Cruces NM 88001

Q/A #4	2:30 - 2:50 PM
Final Remarks	2:50 -2:55 PM

Concurrent Session #2

Period A2 - Population and Public Health Research

SEQUENCE NO.	TIME	ABSTRACT NUMBER	PRESENTATION TITLE
1	8:15 AM	307	REPEALING THE AFFORDABLE CARE ACT: A META-ANALYSIS OF THE IMPLICATIONS ON BORDER STATE REGIONS Phu N, Manseau K, Baska M, Cuellar W, Rodrigo A, Ramos VL, and Ontiveros SJ Department of Anatomy and Cell Biology, Burrell College of Osteopathic Medicine, Las Cruces NM, 88001
2	8:25 AM	308	DIABETES IN NEW MEXICO: AN EPIDEMIOLOGIC STUDY TO DESCRIBE INEQUITIES IN DISEASE BURDEN AND SELECTED SOCIAL DETERMINANTS OF HEALTH Tekin YG[1], De La Rosa V[1], Ochs SD[1], Mata HJ [1,2] [1]Department of Biomedical Sciences, Burrell College of Osteopathic Medicine, Las Cruces, NM; [2]Department of Public Health Sciences, New Mexico State University, Las Cruces, NM
3	8:35 AM	309	BENEFITS AND BARRIERS TO HEALTHCARE ACCESS UTILIZING TELEMEDICINE SERVICES AT NORTH SHORE COMMUNITY HEALTH Phan A, Burt-Miller J, and Toth D Burrell College of Osteopathic Medicine. The University of South Carolina School of Medicine Greenville. North Shore Community Health in Salem, MA
Q/A #1	8:45 – 9:05 AM		Panel Discussion

Period B2 - Biomedical Research

SEQUENCE NO.	TIME	ABSTRACT NUMBER	PRESENTATION TITLE
4	9:25 AM	110	DEVELOPMENT OF A SENSITIVE AND SPECIFIC ASSAY FOR FIELD DIFFERENTIAL DETECTION OF DENGUE-1, WEST NILE, AND ZIKA VIRAL RNA USING RT-PCR, LAMP, AND QUASR

			Cooley C, Fenelon E, Gonzalez J, Woods M, Bramblett D Department of Microbiology and Pathology, Burrell College of Osteopathic Medicine, Las Cruces, NM, 88001
5	9:35 AM	111	ACUTE LYMPHOBLASTIC LEUKEMIA AND THE ASSOCIATION OF ALL WITH HISPANIC POPULATIONS, A LITERATURE REVIEW Oussama A, Jamil A, and Ontiveros SJ Department of Anatomy and Cell Biology, Burrell College of Osteopathic Medicine, Las Cruces, NM 88001
Q/A #2	9:45 - 10:05 AM		
Coffee Break	10:45 - 11:00 AM		

Period C2 - Clinical & OMT Research 1

SEQUENCE NO.	TIME	ABSTRACT NUMBER	PRESENTATION TITLE
6	11:00 AM	206	COMPARING THE RECOVERY RATES OF CARPAL TUNNEL RELEASE ON NON-DIABETICS AND DIABETICS (WITH AND WITHOUT SMALL FIBER NEUROPATHY) Jamil A, Shaghaghi N, Monsivais J Hand and Microsurgery Center of El Paso, El Paso, TX 79925
7	11:10 AM	207	TINEA CORPORIS MASQUERADING AS A DIFFUSE GYRATE ERYTHEMA: CASE REPORT AND A REVIEW OF ANNULAR LESIONS MIMICKING A DERMATOPHYTE SKIN INFECTION Diep D[1], Calame A[2], and Cohen PR[3] [1]Burrell College of Osteopathic Medicine, Las Cruces, NM 88001;[2]Compass Dermatopathology, San Diego, CA 92121;3San Diego Family Dermatology, National City 91950
8	11:20 AM	208	OPERATIVE RECONSTRUCTION OF SYMPTOMATIC RIB NONUNIONS AND OUTCOMES Ogunleye TD, Daniel DA, Schroder LK, Cole PA University of Minnesota/Regions Hospital; Burrell College of Osteopathic Medicine
Q/A #3	11:30 -11:50 AM		Panel Discussion
Lunch	12:00 - 12:30 PM		
Keynote	12:30 - 1:30 PM		

Period D2 - Clinical & OMT Research 2			
SEQUENCE NO.	**TIME**	**ABSTRACT NUMBER**	**PRESENTATION TITLE**
9	1:40 PM	209	GREEN NEUTROPHILIC INCLUSIONS AND A NOVEL ASSOCIATION WITH GANGRENOUS ISCHEMIC COLITIS Marshall MR[1] and Rios I[2] [1]Burrell College of Osteopathic Medicine, Las Cruces, NM 88001, [2]Mountainview Regional Medical Center, Las Cruces, NM 88011
10	1:50 PM	210	ATYPICAL PRESENTATION OF TAKOTSUBO CARDIOMYOPATHY IN 77 YEAR OLD FEMALE: A CASE REPORT Jamil A[1], Reyes S[1], Wasao Z[2], Ogaga R[2], and Olusanya A[2] [1]Burrell College of Osteopathic Medicine, Las Cruces, NM [2]Del Sol Medical Center, El Paso, TX
11	2:00 PM	211	THE IMPORTANCE OF RESILIENCE AND REHABILITATION IN PATIENTS WITH METASTATIC SPINAL CORD COMPRESSION: A CASE STUDY Tran CM[1] and Tyson S[2] [1]Burrell College of Osteopathic Medicine, Las Cruces, NM 88001 [2]MountainView Medical Group – Orthopedics and Musculoskeletal Care, Las Cruces, NM 88011
12	2:10 PM	212	LATE ONSET HEARING LOSS IN VERY LOW BIRTH WEIGHT PREMATURE INFANTS: PRIMARILY CONDUCTIVE VS SENSORINEURAL Liu CA[1,2] and Iwamoto LM[1] [1]Department of Neonatology, Kapiolani Medical Center for Women and Children, Honolulu, HI, 96826; [2]Burrell College of Osteopathic Medicine, Las Cruces, NM, 88003
Q/A #4	2:20 - 2:40 PM		Panel Discussion
Final Remarks	2:50 - 2:55 PM		

Welcome & Opening Remarks

Dr. Don Peska, Dean & CAO, Burrell College
Dr. Joseph Benoit, Assistant Dean for Research
Dr. Steven J. Ontiveros, Director of Student Research

Concurrent Session 1

8:00 AM – 8:15 AM

Keynote Speaker

Thomas Yorio, Ph.D.
Provost Emeritus
Professor, Pharmacology & Neuroscience
University of North Texas Health Science Center at Fort Worth, TX

Keynote Title

Neuroprotective Strategies in the Treatment of Glaucoma

Concurrent Session 1

12:30 PM – 1:30 PM

KEYNOTE SPEAKER

Dr. Thomas Yorio, Ph.D.

Provost Emeritus and professor of Pharmacology and Neuroscience, University of North Texas Health Science Center at Forth Worth, TX.

Biographical Sketch

Thomas Yorio, Ph.D. is a Provost Emeritus and Professor of Pharmacology & Neuroscience at the University of North Texas Health Science Center at Forth Worth, TX, and North Texas Eye Research Institute. Dr. Yorio received his Doctor of Philosophy degree in biomedical sciences from Mount Sinai School of Medicine, and his Bachelor of Science degree in biology from Herbert Helmna College.

Dr. Yorio's laboratory focuses on glaucoma. Areas of interest include aqueous humor dynamics, identifying potential targets for neuroprotection with an emphasis and on the role of optic nerve astrocytes in neurodegeneration. Additional studies focus on neuroprotective properties of sigma-1 receptors and in the area of glucocorticoid pharmacology and ocular hypertension, specifically on understanding the role of glucocorticoid receptor (GR) beta in dampening the ocular hypertensive response of glucocorticoids.

Concurrent Session 1

Clinical & OMT:	8:15 AM – 9:25 AM
Population & Public Health:	9:25 AM – 10:45 AM
Biomedical 1:	11:00 AM – 12:00 PM
Biomedical 2:	1:40 PM – 2:50 PM

Concurrent Session 2

Population & Public Health:	8:15 AM – 9:05 AM
Biomedical:	9:25 AM – 10:05 AM
Clinical & OMT 1:	11:00 AM – 11:50 AM
Clinical & OMT 2:	1:40 PM – 2:40 PM

ABSTRACT #101S

VIABILITY OF CLOTRIMAZOLE AND RESVERATROL FOR COMBINATORIAL CANCER THERAPY

Ablao RM*, Farhad R*, Gallegos SA*, and Ontiveros SJ
Department of Anatomy and Cell Biology, Burrell College of Osteopathic Medicine, Las Cruces, NM
*Authors contributed equally

Introduction: It is estimated that in 2020, more than 600,000 deaths in the US will occur from cancer alone, equating to approximately 1,660 deaths per day from cancer. Although great advancements have been achieved, given the prevalence of cancer in the US, developing efficacious therapies that are well tolerated has evolved into a pertinent clinical goal. Compared to normal cells, it has been demonstrated that malignant cells acquire a variety of capabilities that bypass normal regulatory mechanisms. For example, the preferential utilization of aerobic glycolysis over other metabolic pathways (the Warburg effect) is characteristic to cancer cells. This is evidenced by the overexpression of glycolytic enzymes, such as hexokinase (HK) enzymes, the first irreversible step in glycolysis. As such, there is a keen interest in developing therapies that exploit these differences to specifically target malignant cells while sparing healthy tissues.

Clotrimazole is a known antifungal medication that has been more recently studied as a novel anticancer agent, targeting several glycolytic enzymes in malignant cells. Resveratrol, a natural polyphenol that is found in red wine, grapes, and berries, has also demonstrated anticancer capabilities by inhibiting glycolysis, and also exhibits anti-inflammatory and antioxidant activities. Studies have demonstrated that combinatorial drug therapies are more efficacious as anticancer treatments as opposed to individual administration. Drugs used in combinatorial therapies employ different mechanisms of action, which can lead to a more pronounced, augmented effect. Currently, many existing studies have investigated the effects of either clotrimazole or resveratrol on various cancer cell types, but none have explored these drugs together in combination therapies to date.

In this review, we will examine the inhibitory actions of clotrimazole and resveratrol on energy metabolism in cancer cells, and the viability of both drugs as a combinatorial cancer therapy.

Methods: We utilized the PubMed database for review of published literature. Experimental studies, review articles, and clinical trials with dates ranging from 1925-2020 were screened. Keywords included: Warburg effect; Glycolysis; Hexokinase; Polyphenol; Resveratrol; Clotrimazole; Combination pharmacotherapies; Cancer combination therapy.

Results: As an anticancer agent, clotrimazole was identified to interrupt glycolytic metabolism through inhibition of the HK-II isoform, PFK-1, aldolase, and pyruvate kinase. Correspondingly, resveratrol exhibits inhibitory actions on HK-II and PFK-1, however, it also suppresses activity of GLUT-1 and phosphoglycerate mutase. Additionally, resveratrol upregulates the activity of pyruvate dehydrogenase, shifting cancer cell metabolism away from lactogenesis and instead towards the tricarboxylic acid cycle. Clinical trials have shown resveratrol's ability to induce apoptosis and cell cycle arrest in colorectal cancer patients. There are limited clinical trials investigating clotrimazole's anticancer effects, but this drug has been shown to reduce oral candidiasis in patients undergoing chemotherapy with minimal side effects. Interestingly, improved therapeutic efficacy of these drugs has been demonstrated in combination with other anticancer agents. Previous studies show improved efficacy of clotrimazole with trametinib, an MEK inhibitor, in human melanoma cell line A375M and with lonafarnib, a farnesyltransferase inhibitor, in a zebrafish melanoma model. Similarly, resveratrol and sorafenib, a protein kinase inhibitor, displayed improved treatment outcomes in combination than each alone in hepatocellular carcinoma.

Conclusions: In previous studies, both clotrimazole and resveratrol demonstrated disparate mechanisms of action on several glycolytic enzymes, successfully interfering with mechanisms required to secure energy sources that are crucial for cancer survival and growth. Success of both drugs in combination with other therapeutics have been indicated in multiple studies. Based on the therapeutic value present in clotrimazole and resveratrol individually, as well as promising data regarding potential combination therapies with each, we believe these drugs will augment their activities, which could serve as an excellent targeted therapy for malignant cells and a significant benefit for cancer patients.

ABSTRACT #102S

CIRCADIAN INFLUENCES ON HYPERTENSIVE RESPONSES TO STRESS

Balami JJ, Gilderman GS, Gosselink KL
Department of Physiology and Pathology, Burrell College of Osteopathic Medicine, 3501 Arrowhead Drive, Las Cruces, NM, 88001

Introduction: Hypertension is a highly prevalent medical condition with major consequences for patients including a higher risk for stroke, the occurrence of which demonstrates circadian patterning with increased incidence between the hours of 6-8am and 6-8pm. Stress may contribute indirectly to the development of hypertension through mechanisms such as elevated levels of vasoconstricting hormones and repeated elevations in blood pressure. Indeed, activation of the hypothalamic-pituitary-adrenal (HPA) axis and the sympatho-adrenomedullary system both occur as a consequence of stress, and the secretion of cortisol or corticosterone, the major output of the HPA axis, also follows a diurnal rhythm. This goal of this study was to examine the complex relationship between stress, hypertension, and circadian cycle. The neurological effects of acute versus repeated restraint stress experienced at different times of the day were assessed in rats with and without a background of hypertension. We hypothesized that neuronal activation would be enhanced by stress, specifically in brain regions with known roles in neuroendocrine and cardiovascular regulation. Furthermore, we hypothesized that stress experienced near the dark phase of the light cycle would have a greater impact on the brain.

Methods: Adult male spontaneously hypertensive (SHR) and normotensive Wistar-Kyoto (WKY) rats were acutely (30min x 1d) or repeatedly (30min x 14d) restrained during the light (0900-1100h) or dark (1800-2000h) phase of the light cycle. Fixed brain sections were immunohistochemically stained for period-1 (*Per1*) protein, a stress-sensitive regulator of circadian rhythms, and *Fos*, a marker of neuronal activation. The number of stained cells was quantified in the paraventricular (PVN) and dorsomedial (DMH) hypothalamic nuclei using light microscopy and digital imaging, followed by analysis of 5 (PVN) or 4 (DMH) sections per rat using ImageJ software.

Results: In the PVN, acute restraint increased the number of cells expressing *Fos* in WKY and SHR rats, regardless of whether the stress was applied in the morning or evening. Repeated restraint exposure often led to an habituation of this response, with fewer PVN cells expressing *Fos* in all groups. Baseline *Fos* levels were elevated, however, in control (non-stressed) SHR rats at night, compared to control SHR rats in the morning or control WKY rats at night. This suggests that while patterns of stress responsivity did not vary across our treatment groups, the magnitude of the acute stress response was enhanced in SHR animals entering their active period as the dark phase of the light cycle began. Acute restraint during the day or night also increased the number of *Per1*-expressing cells in the PVN, but only in SHR rats, and a similar response was seen for *Fos*-positive cells in the DMH of SHR rats exposed to acute stress. Results on *Per1* expression in the DMH appear to be highly variable, but with potentially increased expression following acute restraint administered at night.

Conclusion: Our data demonstrate that, regardless of whether an individual is hypertensive or normotensive, the experience of stress remains significant. It is important to note that the time of day when stress is experienced may play a critical role in its downstream effects and ultimate health consequences. Previous work by our laboratory and others suggested that SHR rats fail to habituate to repeated stress exposure. This was not corroborated by the current study, but we do demonstrate here that SHR animals display exaggerated responses to acute stress, particularly when it occurs near the start of their active period. Our findings support our hypotheses, and identify a possible link between stress, hypertension and stroke. Understanding the complexity of these interactions may aid in the development of subsequent treatments for these and related conditions.

ABSTRACT #103S

THE EFFECTS OF CANNABIDIOL ON NEUTROPHIL EXTRACELLULAR TRAP (NET) FORMATION

Alonzo MA*, Hochstein B*, Germaine C, Good Z, Grayeb D, Lee S, and Woods ME
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Introduction: Neutrophils are the predominant cell type in acute inflammatory conditions. Neutrophils neutralize pathogens via phagocytosis, degranulation with the release of cytotoxic agents, and through Neutrophil Extracellular Trap (NET) formation, or NETosis. NETosis is a form of regulated cell death whereby neutrophils expel chromatin complexed with granular proteins to form a mesh-like structure that has the capability of entrapping and destroying extracellular pathogens. Moreover, NETosis involves citrullination of histones by peptidylarginine deiminase 4 (PAD4), which can contribute to NET aggregates through nuclear decondensation. NETs have been implicated in the pathogenesis of a number of autoimmune and inflammatory conditions such as systemic lupus erythematosus (SLE), rheumatoid arthritis, atherosclerosis and most recently COVID-19. Thus, interventions for regulating the damaging effects of neutrophil activity are being actively explored. Recent developments regarding the cannabinoids and their benefits in alleviating pain, inflammation, ischemic diseases, and other conditions have provided an avenue that is worth investigating. Cannabidiol (CBD), like THC, is derived from *Cannabis sativa* but is non-psychoactive with proven therapeutic properties, such as anti-inflammatory and antioxidant effects. Previous studies have confirmed CBD effects on neutrophil activation; however, the activity of CBD on NETosis has not been investigated. We hypothesized that CBD pretreatment reduces NETosis in response to phorbol 12-myristate 13-acetate (PMA) and the calcium ionophore A23187 stimulation of human primary neutrophils.

Methods: Neutrophils were isolated from donor blood using Polymorphprep. Isolated purified neutrophils were pretreated with 10 µM cannabidiol for one hour, then stimulated with PMA (100 nM) and calcium ionophore (2.5 µM) to induce NETosis. NETs were stained with anti-myeloperoxidase or anti-neutrophil elastase, imaged via immunofluorescence microscopy, and quantified with ImageJ. Cells and NETs were manually counted, and NETs were standardized by quantifying the number of NETs per 100 cells.

Results: PMA and calcium ionophore stimulation effectively induced NETs in the neutrophil isolates. Neutrophils stained with anti-MPO and stimulated with PMA formed a mean value of 39 NETs per 100 cells while the unstimulated group only formed 5.7 NETs per 100 cells. Neutrophils stained with anti-NE and stimulated with calcium ionophore formed 21.7 NETs per 100 cells while the unstimulated group formed 12.4 NETs per 100 cells. Neutrophils pretreated with 10 µM of CBD and stimulated with PMA formed a lower number of NETs in comparison to the "No Pretreatment" group. PMA-induced neutrophils stained with anti-MPO that did not receive pretreatment yielded 65.4 NETs per 100 cells, whereas PMA-induced neutrophils that were pretreated with CBD yielded 34.5 NETs per 100 cells. Anti-NE stained neutrophils without pretreatment formed 54.7 NETs, and 43.6 NETs in the CBD treated group.

Conclusion: Based on the results of this experiment we can conclude that the addition of CBD to neutrophils *in vitro* reduced NETosis. This data supports the current literature which has stated that CBD has an anti-inflammatory effect on the body. This experiment can be expanded to include a standardized method of NET quantification via plate assay since manual counting may have introduced error. These results also warrant an investigation into the effects of CBD on NET-activating pathways.

ABSTRACT #104S

EXERCISE INDUCED HYPOTENSION AND GLUCOCORTICOID SENSITIVITY

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Introduction: Hypertension affects nearly 46% of adults, increases risk for cardiovascular disease, and contributes to nearly 1300 deaths per day in the US (CDC 2019). Previous research reflects an association between increased dermal microvascular sensitivity to topical glucocorticoids and increased risk for hypertension. Additionally, endurance exercise is associated with subsequent decreased blood pressure (BP) known as post-exercise hypotension (PEH) that can last up to 13 hours and may contribute to treatment (Chen and Bonham, 2010). There is also evidence linking glucocorticoid activity to reduced histamine synthesis and histamine receptor (H1R and H2R) expression, which are essential components of the PEH mechanism (Karlstedt et. al., 1999). However, it is yet to be determined how varying levels of glucocorticoid sensitivity correlate to PEH. Based on these observations, we hypothesize that individuals with higher resting BP will have increased glucocorticoid sensitivity and an attenuated magnitude and duration of PEH.

Methods: We will recruit 54 volunteers across the normal, elevated, and stage-I hypertensive (unmedicated) range, are 20-40 yrs, have a BMI $\leq$ 30, and are without cardiovascular or other chronic disease. Recruitment will come exclusively from the "Incremental Exercise and Glucocorticoid Sensitivity" (Study 1) protocol. Study 1 will collect a glucocorticoid vasoconstrictor assay (glucocorticoid sensitivity), saliva (11β HSD2 activity), and serum (primarily 11βHSD1 activity) samples. Subjects will report to our laboratory in the morning after an overnight fast. Baseline BP and heart rate (HR) will be obtained by an automated Polar HR monitor. Participants will exercise on a cycle ergometry for 60 minutes at 60% of the VO2 max. The first 5 minutes of exercise will be a warm-up and the last 5 minutes will be a cool down period. During exercise, BP and HR will be measured at the 5, 15, 30, and 45 minute marks using a Tango medical monitor (SunTech, Morrisville, NC) and sphygmomanometer. Rated Physical Exertion (RPE) will be obtained at the same time points as the HR and BP using a Borg's scale. At the 5 minute mark of exercise, VO2 uptake will be monitored through a TrueOne 2400 metabolic cart system (ParvoMedics) and blood lactate will be collected via finger prick (Lactate Plus Analyzer). During the post-exercise period, BP and HR will be recorded at the 15, 30, 45, 60, 75, and 90 minute marks. We will also examine post-exercise BP values obtained from participants in Study 1 under the same time points and resting conditions mentioned above. Subjects will be permitted access to water ad libitum.

Conclusion: Our goal is to determine whether a correlation exists between glucocorticoid sensitivity and PEH. An association might be explained through previous observations. For instance, prolonged PEH relies on activation of H1R and H2R activity, and increased shear stress during exercise is believed to promote histamine production in large vessels like the aorta. Furthermore, increased expression of the enzyme responsible for histamine synthesis (histidine decarboxylase) is upregulated in mice when exposed to conditions of prolonged exercise (Halliwell, 2013). While on the other hand, increased glucocorticoid activity is linked to decreased H1R and H2R mRNA expression (Karlstedt et al, 1999). We believe this study can potentially contribute to future therapeutic interventions, as it is possible that individuals with low sensitivity to glucocorticoids are more likely to benefit from incorporating exercise in their treatment protocol. Additionally, if someone is highly sensitive to the known adverse effects of chronic glucocorticoids, the histamine pathway may be attenuated. Consequently, any therapeutic effect of aerobic exercise on lowering BP below baseline might be compromised.

ABSTRACT #105S

INCREMENTAL EXERCISE BLOOD PRESSURE AND CLUCOCORTICOID SENSITIVITY

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Introduction: During graded exercise, systolic blood pressure (BP) increases as exercise intensity increases. Certain individuals show an exaggerated exercise systolic blood pressure response (EEBP) which is a predictor of "masked" and future hypertension. Although the full mechanism is not fully understood, a correlation between EEBP and vasoconstrictive responses have been shown. Furthermore, little is known about the role of glucocorticoids on BP regulation during exercise. Previous studies at rest on hypertensive patients have shown increased sensitivity of the skin microcirculation to topical glucocorticoids using the vasoconstrictor assay, compared to controls. Therefore, it remains unknown if glucocorticoid sensitivity (GS) is a possible predictor of EEBP. Separately GS and EEBP are associated with changes to microvasculature. For instance, impaired actions of glucocorticoid metabolism markers such as the 11B-hydroxysteroid dehydrogenase (11B-HSD) enzymes have been shown to influence vascular smooth muscle tone. Likewise, several markers of the EEBP are involved in inflammation and endothelial dysfunction. The proposed study will test the hypothesis that increased sensitivity to topical glucocorticoids is associated with higher BP during exercise, and examine the relationship between glucocorticoid metabolism markers and the EEBP response including 11B-HSD type 1 and type 2.

Methods: We plan to recruit 54 volunteers, male and female, with BP ≤ 139/89, ages 20-40yrs and BMI ≤ 30. A health history questionnaire and the Physical Activity Readiness Questionnaire will be used to exclude subjects with a history of cardiovascular disease, use of cardiovascular medication, tobacco use, other chronic illnesses, and steroid usage or allergies. Subjects unaware of their medical status will be further tested for risk factors including high cholesterol and blood sugar. Each subject will report to the laboratory for three separate visits. Visit-1(any time before visit-2) will consist of orientation to the study and obtaining informed consent. During Visit-2 (1PM-4PM), resting cardiovascular measurements will be assessed using size appropriate equipment at least twice at five-minute intervals and averaged. Followed by application of skin vasoconstrictor assays and attachment of an ambulatory BP monitor (ABPM) for diurnal BP monitoring. With visit-3 (following morning 7am-9am, fasting) subjects will have the ABPM removed, digital images of the vasoconstrictor assay taken for later analysis, and resting metabolic rate tested to obtain a baseline. Resting cardiovascular measurements will be conducted again as described above. Then, baseline saliva and blood samples (1mL and 100uL respectively) will be simultaneously collected to determine cortisol and cortisone levels. Next, a cycle ergometer maximal exercise test will be conducted in 3-minute stages, with a cool down period and an immediate second blood sample collection for post exercise lactate analysis (10uL). Subjects will then be moved to a seated chair where final BP measurements will be taken every 15 minutes for a total of 75 minutes.

Conclusion: In the proposed study, we plan to test GS and 11B-HSD enzymes via vasoconstrictor assay and the EEBP via a maximal exercise stress test. GS will be tested through the degree of skin blanching caused by beclomethasone dipropionate, a synthetic analog for cortisol. 11B-HSD1 (converts inactive cortisone to active cortisol), activity will be tested via application of cortisone acetate. 11B-HSD2 (cortisol to cortisone), activity will be tested via the application of glycyrrhetinic acid (GA) alone and in conjunction with hydrocortisone acetate. GA is a structure analog of cortisone that inhibits the activity of 11B-HSD2. Therefore, increased or impaired actions depending on the type will lead to increased cortisol, which could be associated with the EEBP. This association might be a useful tool to predict an EEBP and its possible mechanisms through GS testing even in normotensives.

ABSTRACT #106S

INVESTIGATING THE EFFECTS OF OLEOCANTHAL ON IN VITRO NEUTROPHIL EXTRACELLULAR TRAP FORMATION AND POSSIBLE LINKS TO AUTOIMMUNE AND INFLAMMATORY DISEASE

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Introduction: Neutrophil extracellular trap formation (NETosis), a process first reported in 2004, is a novel form of innate immune defense that has been linked to autoimmune and inflammatory diseases. Neutrophils, the most abundant type of white blood cell, utilize various mechanisms to protect the host from foreign pathogens. One such mechanism is NETosis, the process by which neutrophils release their genomic content to immobilize and trap fungi, bacteria and viruses. Neutrophil extracellular traps (NETs), are the modified chromatin structures containing proteins such as myeloperoxidase (MPO) and neutrophil elastase (NE), released by activated neutrophils, in effort to induce microbial cell death. However, this antimicrobial immune response has been associated with the promotion of inflammation. Current research has described a link between excessive NET formation or their extended persistence, and the exacerbation of autoimmune and chronic inflammatory diseases. There are various mechanisms by which this occurs, including the production of autoantibodies. The Mediterranean diet has been shown to be protective of these diseases. An integral component of this diet is virgin olive oil. Oleocanthal, a phenolic compound found in olive oil, has been described as a potent cyclooxygenase (COX) inhibitor, not dissimilar to synthetic NSAIDs. COX produces prostaglandin E2 (PGE2) in response to noxious stimuli and is a known inflammatory mediator. Previous studies have established a link between increased PGE2 production and induction of NETosis. For this reason, the therapeutic use of oleocanthal is implicated in reducing inflammation by means of NETosis inhibition for diseases such as cancer, joint-degenerative diseases, systemic lupus erythematosus, systemic sclerosis, inflammatory bowel disease, and more. We hypothesized that oleocanthal would alter NETosis in response to phorbol 12-myristate 13-acetate (PMA) or calcium ionophore A23187 (CI) stimulation in primary human neutrophils.

Methods: Human neutrophils were isolated and purified from serum using Polymorphprep™ density gradient medium and suspended in RPMI-1640 medium. The neutrophils were pre-treated with 10μM of oleocanthal for one hour. They were stimulated with NET activators (100μM of PMA and 2.5μM of CI), incubated for 2.5 hours, and fixed in 4% paraformaldehyde (PFA). Immunofluorescence microscopy was performed using primary antibody (anti-myeloperoxidase antibody produced in rabbit and anti-neutrophil elastase antibody produced in rabbit) and secondary antibody (goat anti-rabbit Alexa Fluor™ 555) dilutions, and stained with ProLong™ Gold Antifade Mountant with DAPI. NETs were visualized with a fluorescence microscope and counted with ImageJ

Results: Our preliminary findings suggest that pretreating neutrophils with oleocanthal reduces the percent of neutrophils that undergo NETosis when exposed to the NET activator PMA, but there was no reduction in NETosis in response to the stimulation with CI. Additionally, our results show that pretreating neutrophils with oleocanthal induces NETosis, an effect that we did not anticipate.

Conclusions: Although some of our conditions show promising results, more research needs to be done to better understand oleocanthal's role in inhibiting NETosis. The literature demonstrates the promising potential that oleocanthal can be used as a therapeutic agent for reducing inflammation in autoimmune and inflammatory diseases.

ABSTRACT #107S

OPTIMIZATION OF RT-LAMP ASSAY FOR ZIKA VIRUS

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Introduction: Zika virus is a mosquito-borne flavivirus that has been a major cause of concern in recent years due to several large outbreaks in Africa, Asia, the Americas, and the Pacific. Zika virus has been found to be linked to more severe diseases like Guillain Barre and poses a particular risk for pregnant women, leading to congenital microcephaly. The current standard for Zika diagnosis is RT-PCR, which is expensive and not optimized for point of care applications. Our goal is to create a cost-effective and user-friendly RT-LAMP diagnostic assay for Zika virus to minimize outbreak risk in New Mexico. The genes targeted for RT-LAMP are NS1 and NS2B as both have been found to be highly conserved across Asian and African strains.

Methods: A primer set corresponding to the NS2B gene was already available in the lab, but untested. New NS1 gene primers were synthesized by first analyzing 29 complete Asian Zika strains selected from Virus Pathogen Database and Analysis Resource (ViPR). Strains were aligned through Clustal Omega software with default parameters. LAMP primers specific to NS1 were designed using PrimerExplorer. PrimerExplorer was run with default parameters and the primer sets with the most negative change in free energy were selected. The BLAST alignment algorithm was used to confirm specificity for consensus Zika sequences and ensure a lack of cross-reactivity with other Flaviviruses and Alphaviruses.

Primers were purchased from Integrated DNA Technologies (IDT) and tested with pH-based WarmStart Colorimetric LAMP (NEB) and then real-time fluorescence RT LavaLAMP™ RNA Master Mix (Lucigen). The pH-based assay was used to determine if the NS2B primers were sensitive to the highly conserved Zika NS2B target sequence in a concentration of 1 x 10^5 copies/uL (ATCC BVR 184DQ) and determine the optimal temperature for the reaction. This was followed by a real-time LavaLAMP™ assay to determine the dose dependent sensitivity of the reaction using fluorescent green dye on the BioRad CFX96 machine. Once NS1 primer sets were designed and synthesized, they were also tested using LavaLAMP™ in real-time.

Results: NS2B primer LAMP results using the pH-based assay showed an optimal temperature of 66.4° C. RT-LAMP Assay using NS2B primers showed positive signals at a dilution as great as 1:3,200,000 or less than one copy per uL. All RT-LAMP assays were run for 30 minutes.

An effort was made to generate primers for the NS1 gene. For this purpose, 2 primers sets were generated using two different methods. The first set was generated by identifying non-conserved bases for exclusion based on 29 strain alignments prior to entry into PrimerExplorer. The second set was generated with a single Zika strain PRVABC59 (Genbank access # KU501215) with no mutations marked for PrimerExplorer. The primer set with the lowest delta free energy was chosen. Neither primer sets showed significant cross-reactivity with Flaviviridae or Alphaviridae. NS1 primer set 2 showed more positive alignment results towards Asian Zika strains compared to NS1 primer set 1 and NS2B primers. Preliminary assay with NS1 primers showed no amplification signal.

Conclusion: RT-LAMP real-time fluorescence assay with NS2B primers detected NS2B sequence in Asian Zika genome within 10 minutes. NS1 primers' negative results could be attributed to challenges creating NS1 primers with more negative delta G or may need further optimization of temperature and $MgSO_4$ concentration. The next step is to develop quenching of unincorporated amplification signal reporters (QUASR) for NS2B primer and test in human blood serum and urine infected with Zika without RNA extraction methods. Further analysis of stock RNA needs to be determined to find the absolute concentration of template RNA.

ABSTRACT #108S

PRIMO-VASCULAR SYSTEM: A PARADIGM SHIFT FOR OSTEOPATHIC MANIPULATIVE TREATMENT

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Introduction: The Primo Vascular System (PVS), first described in the 1960s by Bong Han Kim, a North Korean investigator, is independent of the arteriovenous (AV) and lymphatic vascular (LV) systems. PVS occurs in vertebrate and invertebrate species. Its extensive distribution in mammals includes inside and surrounding AV and lymphatic vessels; and within fascial planes, the PNS and CNS. Proposed functions of PVS suggest involvement in cell proliferation, healing, and homeostasis. Based on his findings, Kim associated PVS with the meridian system of acupuncture, a mechanosensory based therapy, and in 2016 Chikly[1], et al. implicated PVS in the efficacy of Osteopathic Manipulative Treatment (OMT). Osteopathic practitioners utilize OMT to relieve inflammation and promote tissue repair. Traditionally, they have relied heavily on lymphatic vascular stimulation to impart various biomechanical stimuli to surface and deep tissues, such as fascia and muscle, thus redistributing fluid through fascial planes to improve circulation and healing. Here we present a synopsis of the current state of knowledge concerning PVS and examine its possible role in OMT.

Methods: Searches were conducted through *PubMed* and *Google* from 1960-present using terms including: Bong Han system; Sanal cell cycle; Primo Vascular System; Primo vessels; Primo nodes; Primo-microcells; mechanotransduction; Osteopathic manipulation; Osteopathic manipulative treatment.

Results: PVS consists of extensive interrelated networks of Primo-nodes (PNs) and Primo-vessels (PVs) categorized into subsystems internal and external to various organs and fascia and AV and lymphatic vessels; central and peripheral nervous systems; within skin layers. Staining techniques, including: Feuglen, Unna-Pappenheim, Brachet, Acridine Orange, and Hematoxylin-Eosin[3] have revealed distinct characteristics differentiating PVs from blood and lymphatic vessels, such as endothelial cells with elongated rod-like nuclei and the absence of both lymphatic vessel endothelial receptor 1, a CD44 homolog, and CD31, a marker specific to blood vessels.[1] PVs conduct primo-fluid (P-fluid) containing primo-microcells (p-microcells), chromaffin granules, hyaluronic acid, and nucleic acids to PNs, which are also extensively distributed throughout the body. Structurally, PNs are tiny (0.1-0.5mm in width and 0.5-1mm in length) with a reticular scaffolding, much as lymph nodes. Giemsa staining demonstrates myeloid and lymphoid progenitor cells and multipotent hematopoietic stem cells in PNs and experiments suggest they function in hematopoiesis.[3] P-microcells, described by Kim as stem cells, arrive at PNs via PVs, then appear to mature prior to exiting for distribution.[3] Following injury, p-microcells appear to migrate through PVs, accumulating and proliferating to enhance restoration of damaged structures, acting as multipotent stem cells of resident tissues.[2] The location of PVs in lymphatic vessels lumens indicates that manual stimulation during OMT would subject PVs to mechanical forces as well, suggesting that the stem cells and hyaluronic acid abundant in p-fluid are disseminated by such manipulation.

Conclusion: PVS interconnects all body systems, and when stimulated by OMT could be involved in the far-reaching effects this therapy has long been thought to accomplish by reestablishing homeostasis and assisting tissue repair. Manipulation of fascial planes, lymphatic vessels and other structures using OMT could alter the PVS microenvironment, activating system components to improve circulation and facilitate self-healing via the redistribution of p-fluid contents. Further research is needed to understand the mechanisms by which OMT could influence PVS.

Citations:

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ABSTRACT #109S

WHAT'S IN THE SOUP? ADVENTURES IN METHODOLOGY FOR QUALITATIVE ANALYSIS OF CADAVER EMBALMING REACTION PRODUCTS ENCOUNTERED DURING HUMAN DONOR DISSECTION

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Introduction: The dissection of a donated human body, can be a wet, messy business—one with unique safety concerns. The chemicals that are employed in the embalming of donated bodies prior to their dissection represent a two-edged sword for laboratory safety. On the positive side, these chemicals are critical for the sanitization and preservation of cadavers so that they might be studied safely by anatomists. On the negative side, although the chemicals introduced into the body are known, the reactions that they can undergo with cadaveric tissues, and the end-product chemical species that result from these processes are understudied and undocumented.[1] The current project will develop and optimize a methodology for the discovery and description of novel chemical reaction products that appear in the fluids draining from human donor bodies (*i.e.*, the soup) during the cadaveric dissection process.

Chemicals such as ethanol, formaldehyde, and phenol are in common usage for the embalming of teaching cadavers. Other "wetting solutions" with additional antibacterial and tissue moistening actions are also routinely used in various quantities per donor body. To further compound the issue, many of these chemical compounds are proprietary formulations, marketed under specific trade names. Thus, the known unknowns amongst solutions routinely used in the anatomy lab are likely chemicals listed as category 1 to category 3 on the Environmental Protection Agency's toxicity category rating.[2]

Methods: Aliquots of our starting material, *i.e.*, "the soup," will be collected into 15 mL tubes, and centrifuged briefly to separate the major solids and fluids. The pellet will be stored for later analysis as part of a future component of this work. The supernatant will be vacuum-filtered through an 11 uM Buchner funnel to remove any remaining large particulates. This filter will also be stored for future study. The filtrate will be added to two volumes of ethyl acetate, mixed by inversion, and the resulting extraction allowed to separate into distinct layers in a separatory funnel. Each of the layers will be collected into a capped glass container and prepared for further analysis using an Agilent 7890A GC-MS with helium as the carrier gas. Sample runs through the GC-MS will be done in triplicate.

Our first focus will be on the analysis of organic components in the drain fluids through Gas Chromatography-coupled Mass Spectroscopy (GC-MS) of the samples collected from the table drains, since any new compounds detected will arguably have resulted from reactions involving the oxidizing and reactive organic components of the embalming fluid. Further analysis of the aqueous (and residual solid) phase constituents will comprise phase two of this study.

Conclusion: Since the safe utilization of donor bodies is a top priority for medical educators everywhere that dissection is used in teaching, the results of this study will help to inform strategies for risk reduction and increased safety in anatomical and surgical education environments.

ABSTRACT #110

DEVELOPMENT OF A SENSITIVE AND SPECIFIC ASSAY FOR FIELD DIFFERENTIAL DETECTION OF DENGUE-1, WEST NILE, AND ZIKA VIRAL RNA USING RT-PCR, LAMP, AND QUASR

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Introduction: With an increase and expansion of arboviruses, symptomatic differentiation between Dengue-1 (DENV-1) and Zika remains a diagnostic challenge for healthcare workers in the absence of advanced laboratory equipment in the field. Headache, fever, rash, and muscle pain are common symptoms to both flaviviruses that increase therapeutic perplexity due to indistinct clinical manifestations. A characteristic assay that is rapid, sensitive, and specific may eliminate uncertainty around the overlapping geographical distribution of the viruses and diagnostic deficiencies. Our research aims to develop an assay for the molecular detection of DENV-1 and Zika based on comparative analysis from RT-PCR, LAMP, and QUASR. Such development may contribute to more efficient epidemiological surveillance and mitigation of arboviruses-related global health threats.

Methods: The assay development occurred in three steps: 1) primers selection, 2) qPCR and RT-LAMP (Loop-Mediated Isothermal Amplification) amplification testing, 3) QUASR (Quenching of Unincorporated Amplification Signal Reporters) probe assembly and testing. The primer sequences for the Dengue-1 virus (DENV-1 Western Pacific) and Zika were obtained from prior successful research using the Primer-Explorer V3 software and GenBank database. Those primers have been tested against isolates using RT-LAMP and qPCR. The qPCR followed the conventional model, whereas the RT-LAMP method processes the amplification reaction under constant temperature (65°C) within 30 min. The RT-LAMP method uses a 6-primer set composed of a combination of forward, backward, and inner primers targeting the DENV-1 and Zika sequences. A warm Start Colorimetric Kit is used to determine the outcome of the viral RNA amplification. If the LAMP primers produce optimal reactions, a QUASR probe design will ensue. We will utilize the Integrated DNA Technologies online platform to create the probe by adding a fluorescent marker at the 5' and a quencher at the 3' for improved visual detection and discrimination between positive and negative samples.

Results: Accumulated delays and logistics challenges have impeded our progress and jeopardized our initial plan. Our results will be published as they become available.

Conclusion: Our current LAMP primers have shown to be ineffective in producing a signal with the RT-LAMP assay. This deficiency may be due to inaccurate primers, incorrect temperatures, or inadequate reagents. Current work includes testing these primers again with different temperatures (Tm) and reagents. If we obtain successful LAMP results, a QUASR probe will be designed, and sensitivity will be determined for each technique, which will be compared against each other.

ABSTRACT #111

ACUTE LYMPHOBLASTIC LEUKEMIA AND THE ASSOCIATION OF ALL WITH HISPANIC POPULATIONS, A LITERATURE REVIEW

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Introduction: The American Cancer Society estimates in 2020, about 6,150 new cases will surface, resulting in approximately 1,520 deaths from ALL in the United States. According to the Leukemia and Lymphoma Society, one person in the US is diagnosed with a blood cancer roughly every three minutes. Leukemia is a cancer of the bone marrow that affects white blood cells and is broadly categorized as acute (fast-growing) or chronic (slow-growing). Two genes that have been found to have significant implications in the development of acute lymphoblastic leukemia (ALL) include Ikaros and Casein Kinase 2 (CK2). Their relationship is inversely proportional, and downregulation of Ikaros and overexpression CK2 has been found to cause uncontrolled immature lymphocyte proliferation and the development of ALL. Another gene that has been recently linked to leukemia is the ETS-related gene (ERG), a member of the erythroblast transformation-specific family, that serves as a critical regulator of embryonic development, cell proliferation, differentiation, and apoptosis. The highest rates of childhood leukemia have been reported for Hispanic children, but whether the higher incidence rate is a result of environmental or genetic factors is unclear. This review aims to illustrate the molecular interactions between Ikaros and CK2, and to evaluate how these regulatory proteins precipitate the development ALL at the molecular level, and to elucidate the potential contributions of increased incidence rates in Hispanic populations.

Methods: We performed a systematic search of literature, journal articles, and peer-reviewed publications. Data was obtained through NCBI, PubMed and DynaMed plus search engines. Data was also collected from various national cancer organizations as well as the Center for Disease Control. Keywords used: CK2, Ikaros, ALL, and Hispanic Populations.

Results: CK2 is a ubiquitous serine/threonine-protein kinase that is involved in cell cycle control, DNA repair, and is an integral part of normal and cancer cell growth and survival, and has been identified as a cell death suppressor. Its upregulation has been linked to the development of disease to at least four of the thirteen hallmarks of cancer. Ikaros is a tumor suppressor protein that binds DNA, and is critical in the regulation of lymphocyte differentiation by supporting the transcription of genes in multipotent and hematopoietic progenitors. Ikaros regulates proliferation through transcriptional repression and does so by regulating chromatin-remodeling complexes of target genes. Studies have demonstrated that overexpression of CK2 can lead to the phosphorylation of Ikaros, which contributes to the development of ALL. The highest rates of childhood leukemia have been reported for Hispanic children, and the downregulation of Ikaros has been observed in ALL in children. Recently, St. Jude's Hospital identified a genetic variation in the ERG gene that is linked to a 1.56-fold increased leukemia risk in Hispanic children, considering its importance in modulating platelet adhesion, vascular remodeling, and regulating hematopoiesis. Mutations in the ERG gene have also been found in prostate cancer, Ewing's sarcoma, acute myeloid leukemia, and most recently ALL.

Conclusion: In the United States, approximately 3 out of 4 children with leukemia are diagnosed with ALL, and occurs commonly in children between the ages two and four. Although the exact cause of ALL remains unclear, one mechanism that may contribute to the development of ALL is the phosphorylation and downregulation of Ikaros via CK2 overexpression. Once downregulated, hematopoietic progenitor cells may bypass the cell cycle regulatory checkpoints in an uncontrolled manner, which can contribute to the development of ALL. Although genetic variations in the ERG gene are linked to increased risk in Hispanic children, the link between the ERG gene and Ikaros/CK2 remains to be investigated.

OCCIPITO-ATLANTAL DECOMPRESSION AND TRANSCUTANEOUS AURICULAR VAGUS STIMULATION SLOWS CONDUCTION VELOCITY THROUGH THE ATRIOVENTRICULAR NODE

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Introduction: Almost 2000 Americans die every day from cardiovascular disease, and more than 70 of these deaths are attributed to atrial fibrillation. Our long-term goal is to utilize occipito-atlantal decompression (OA-D) and transcutaneous auricular Vagus Nerve Stimulation (taVNS) as adjunct therapies to prevent ventricular tachycardia in patients with atrial fibrillation. While it is known that OA-D[1] and taVNS[2] increase cardiac parasympathetic tone, it is not known if these techniques also slow conduction in the atrioventricular (AV) node through their effects on cardiac parasympathetic activity. Therefore, the objective of this study is to establish a mechanistic link between increased cardiac parasympathetic activity and prolongation of AV conduction in volunteers subjected to OA-D or taVNS. The hypothesis of this study is that OA-D and taVNS not only increase cardiac parasympathetic tone as assessed by heart rate variability, but also slow AV nodal conduction, assessed by the PR interval of the electrocardiogram (EKG).

Methods: EKGs were obtained from two prior studies that utilized similar protocols. In these studies, EKGs were recorded in healthy volunteers on three consecutive days during a 30 min baseline recording, 15 min intervention, and 30 min recovery period. Participants were randomly assigned to one of three experimental groups that differed in the 15 min intervention. The first group (n= 9) received OA-D for 5 min, followed by 10 min of rest. The second group received 15 min of taVNS (n=11). The intervention in the third group that served as a control group (CTR, n=9) consisted of 15 min rest. The RR- and PR-intervals were extracted from the EKGs using the Hemolab software and then used to assess heart rate variability and AV-conduction, respectively.

Results: RR intervals lengthened (CTR +3.0±1.8 ms, OA-D +4.8±2.1 ms, taVNS +3.7±1.4 ms, no significant difference between groups) indicating a decrease in heart rate throughout the duration of the experimental protocol, possibly as a result of higher sympathetic tone at the beginning of the protocol. RMSSD was significantly higher at the end of the protocol compared to the beginning of the protocol in the OA-D (54.6±8.9 ms vs.49.8±9.0 ms, $p<0.05$) and taVNS groups (45.4±9.7 ms vs. 41.7±9.9 ms, $p<0.05$), but not in the control group (31.3±2.6 ms vs. 27.8±2.4 ms, n.sig.). The increase in RMSSD by OA-D and taVNS suggests increased cardiac parasympathetic tone, which translated into a lengthening of the PR-interval only in the OA-D (170.5±5.4 ms vs. 166.8±5.4 ms, $p<0.05$) and taVNS (166.6±3.5 ms vs. 162.1±3.3 ms, $p<0.05$) groups, but not in the control group (162.9±5.0 ms vs. 160.1±5.1 ms, n.sig.). There were no differences in the PR-intervals at the beginning of the protocol between the three study days in any group, suggesting the negative dromotropic effect of OA-D and taVNS did not last into the following day.

Conclusions: The increase in RMSSD by OA-D and taVNS demonstrated that these interventions elevate cardiac parasympathetic tone. The lengthening of the PR-interval by OA-D and taVNS revealed a reduction in the AV nodal conduction velocity. Thus, it is reasonable to assume that the effects of OA-D and taVNS on AV nodal conduction is mediated through an increase in cardiac parasympathetic tone elicited by these interventions. Based on these findings, we speculate that OA-D or taVNS may potentially prevent ventricular tachycardia in patients with atrial fibrillation.

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NON-FRUCTOSE BASED BEVERAGES: ASSESSMENT ON PROGRESSION OF METABOLIC SYNDROME

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Introduction: Previous studies on animal models have implicated dietary fructose in the progression of metabolic syndrome (MetS) and development of non-alcoholic fatty liver disease (NAFLD), both risk factors for the development of Type 2 Diabetes Mellitus (T2DM). However, correlation of these animal models to human health and nutrition have been up to now difficult to make. This is due, in part, to the slow nature of progression in each of these diseases, typically taking years to see large changes in metabolic parameters or liver health. As a result, this makes studying the effects of individual parameters on disease progressions in MetS, NAFLD, and pre-diabetes in a relatively short-term clinical study difficult. Additionally, testing for the diagnosis of and tracking progression for these diseases are often expensive or imprecise. Liver biopsy remains the gold standard for the diagnosis of NAFLD, however this is not feasible with our current design. MRI or CT-scanning technology can precisely measure liver health, but are prohibitively costly. Ultrasound imaging can be affordable, but is subject to the skill and interpretation of a technician. Anthropometric measurements, like waist circumference, are a strong indicator of metabolic syndrome, but require an office and a doctor to be on staff to record measurements. Faced with these challenges, the objective of this study was to potentially develop a fundamental advance in beverage nutritional studies. The study must address two key questions before beginning a clinical trial: 1) what are the key physiological measurements for fructose based beverages to track changes in metabolic syndrome and liver health within our experimental and control groups, and 2) What timeframe for the clinical trial could capture the potential changes in the physiological and lab value measurements. Based on literature review directed by experts in the field of nutrition we believe in eight weeks we are likely to measure changes in subjects drinking fructose based beverages that may correlate to MetS, NAFLD, and T2DM.

Methods: In our project, our study population will include both male and female adults between the ages of 18-50 years who have pre-metabolic syndrome or have been diagnosed with metabolic syndrome. In addition, participants will be required to have had a liver function panel (AST, ALT, ALP, GGT), lipid panel (fasting total cholesterol, fasting LDL-C, fasting HDL-C, fasting triglycerides), HbA1C, and fasting glucose, collected within 90 days of recruitment. Patients will be randomized into one of three groups: negative control (water), positive control (full sugar soda) and experimental group (iso-caloric non-fructose beverage). Participants will be required to drink a specified number of beverages while eliminating all other soda/sugar sweetened beverages for eight weeks. They will also be required to maintain their normal caloric intake and exercise routine. Participants will go through weight, body mass index, blood pressure, fasting triglycerides, fasting HDL, LDL, AST, ALT, HbA1c and gamma- glutamyltransferase testing on day 0 and day 60, and blood pressure and finger stick glucose testing on Day 31.

SPLENIC PUMP CHANGES CIRCULATING IMMUNE CELL PROFILE LEADING TO ALTERED CYTOKINE RELEASE

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Introduction: Biologic drugs, such as TNF-alpha inhibitors have revolutionized the therapy of chronic inflammatory diseases and improved the quality of life of affected patients. However, because of the high cost and specific contraindications associated with such drugs, there is a need for additional treatment strategies. Our long-term goal is to establish such treatment strategies based on osteopathic manipulative treatment (OMT). There is a paucity of data demonstrating a mechanistic link between OMT and its potential effects on the immune system [1]. The objective of the current study was to establish such a mechanistic link by investigating the effect of the splenic pump OMT technique on the circulatory immune cell profile and the corresponding cytokine release. The splenic pump technique is of particular interest because it may redistribute immune cells from the spleen to the systemic circulation. *The hypothesis* of this study is that the splenic pump technique changes the relative abundance of circulatory immune cell sub-populations, leading to altered cytokine plasma levels and immune cell function.

Methods: Two groups of subjects underwent either splenic pump (n=4) or a sham (no treatment) procedure (n=4) on three consecutive days. Splenic pump was performed by an osteopathic physician. A sphygmomanometer cuff inflated to 20 mmHg was placed under the subject's left lower ribcage and rhythmic compression (30 compressions every minute for 10 minutes) was applied. This technique raised the cuff pressure by 2-4 mmHg. At the end of the third day venous blood samples were collected. Blood was centrifuged and plasma stored at -80ºC. Erthryocytes were lysed and leukocytes isolated. Flow cytometry was used to identify different cell populations (T-helper cells, cytotoxic T cells, B cells, natural killer cells, monocytes, and dendritic cells). Additional fractions of leukocytes were incubated with the TLR-4 ligand lipopolysaccharide for 36 hours and the supernatant was stored at -80ºC for subsequent determination of cytokine levels. Cytokine levels (IL-1b, IL-6, IL-8, IL-10, TNF-α) in the plasma and supernatant were detected using a protein dot blot technique (custom cytokine array, manufactured by RayBioTech). Dot blots were analyzed using NIH ImageJ software. Validity of the dot blot technique was demonstrated by a marked increase in cytokine release into the supernatant by leukocytes stimulated by TLR-4 ligand compared to non-stimulated cells.

Results: Three consecutive days of splenic pump application doubled the number of circulatory monocytes (1.6±0.2% vs. 0.8±0.1%, Mann-Whitney U-test: splenic pump vs. sham intervention, $p<0.05$). This increased number in circulatory monocytes coincided with a significant increase in plasma IL-6 cytokine levels (1.4±0.3 arbU vs. 0.6±0.2arbU, Mann-Whitney U-test: splenic pump vs. sham intervention, $p<0.05$). No significant differences were observed for cytokine release from TLR-4 ligand stimulated cells obtained from subjects who underwent splenic pump applications compared to subjects who underwent the control intervention.

Conclusion: Three consecutive days of splenic pump application increased circulatory monocytes and plasma IL-6 levels. These results suggest that the splenic pump technique translocates monocytes from the spleen to the systemic circulation. Since IL-6 is one of the signature cytokines for monocytes [2], it is reasonable to assume that elevated IL-6 plasma levels originated from these translocated monocytes. No change in immune cell function was observed in TLR-4 ligand stimulated leukocyte cultures. The splenic pump technique may be clinically useful to elevate circulatory monocyte numbers and IL-6 plasma levels, thereby facilitating the resolution of inflammatory insults.

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ABSTRACT #204S

USING FORCE SENSORS TO ESTABLISH CLINICAL GUIDELINES FOR THE ABDOMINAL PALPATION EXAM

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Introduction: Audio and visual media have provided a baseline for student healthcare professionals to learn various sounds heard when auscultating with their stethoscopes or viewing the retina with an ophthalmoscope. Other physical examination skills, such as abdominal palpation, have no such baseline. When performing a general abdominal exam, healthcare professionals are taught to evaluate the abdomen by applying light pressure followed by heavy pressure in the four abdominal quadrants. Light pressure refers to performing an exam by applying force with one hand, and heavy pressure refers to performing an exam by applying pressure with one hand placed on top of the palpating hand. The current body of literature and clinical guidelines do not list a set of force values practitioners should exert when conducting an abdominal exam. A lack of standardization of force between healthcare workers when conducting an exam has the potential to create inconsistencies in clinical findings and an increase in the potential for misdiagnosis. The aim of our study is to use the novel.de loadpad sensors™ to establish a set of clinical standards of pressure to be applied during physical examination of the abdomen and evaluation of hollow and solid organs.

Methods: The lightweight novel.de loadpad sensors™ consist of a 3.5 x 2.5 cm x 4 mm force sensor attached battery pack using a strip of leather. This sensor is attached to the examiner's index and middle fingers of their dominant hand using double-sided tape. The battery pack is attached to the examiner's wrist using a Velcro bracelet. The subject is asked to lay supine on an exam table, with their hips and legs flexed such that the soles of their feet are flat on the exam table. The examiner is requested to perform a general abdominal exam on the patient, standing on the same side of the patient as the examiner's dominant hand. The force they exert while performing the exam is measured on an iPad. The examiner is then asked to palpate the liver, spleen, and kidney of the patient. The force versus time graph is then examined.

Results: Preliminary results of this study consist of force measurements obtained during an abdominal exam as performed by two experienced physicians. Light pressure palpations were found to be 3 to 5 Newtons. Heavy pressure palpation was found to be 9 to 10 Newtons. Liver palpation was found to be 8 to 9 Newtons. Spleen palpation was found to be 9 to 10 Newtons. Kidney palpation was found to be 10 to 11 Newtons.

Conclusions: These preliminary results show the novel.de loadpad sensors™ will be able to collect the necessary data to establish clinical guidelines for abdominal examination pressures. As this study progresses, we would like to enroll a variety of clinicians and standardized patients representing a wide range of Body Mass Indices in order to ascertain the validity of the forces utilized in abdominal palpations.

STANDARDIZING STERNOCLEIDOMASTOID MUSCLE SURFACE EMG MONITORING FOR ENERGY LOADING AND ELECTRICAL ACTIVITY ANALYSIS

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Introduction: Current superficial neck muscle surface electromyography (sEMG) studies have provided limited understanding of the characteristics of muscle energy activity during motion and loading. This further restricts our ability to quantify a physiological response of superficial neck muscles to osteopathic intervention. Our objective in the study is to investigate controls and confounding variables of current sternocleidomastoid (SCM) sEMG procedures. With this analysis, we aim to create recommendations for improved, standardized data collection methods for OMT application and evaluation.

Methods: The reports we reviewed consisted of occupational injury, whiplash, neck pain, and neck muscle electromyography studies. From this current literature, we identified and analyzed trends and best practices in electrode placement, subject position for muscle isolation, normalization of sEMG readings, and outcome analysis. We consolidated a number of measurement techniques to suggest an isolated SCM activity that should allow for suitable, reproducible EMG recording during active muscle loading applications and muscle energy techniques.

Results: We assessed methodologies and limitations presented in each experiment to adapt a sound standardization study for electrical activity and force production of the sternocleidomastoid muscles. The SCM is consistently referenced as a primary axial rotator of the head and an ideal candidate for sEMG from the superficial neck muscles. On healthy subjects (defined here as asymptomatic and lacking neck and back pain), our strategy for electrode placement calls for identifying the SCM muscle belly between the mastoid process and sternal notch. Our EMG electrodes will be placed at the midpoint of the SCM with a 2 cm interelectrode distance. An additional reference electrode will be placed above the C7 spinous process. The EMG signal-to-noise ratio will be maximized by placing each subject in a seated, upright position. We will also use chest restraints to minimize neighboring muscle activity and postural confounding variables, furthering isolating neck muscle movement. To account for normal variation in structure and function in the subject pool, we will initially measure the Maximum Voluntary Isometric Contraction (MVIC) of each subject to normalize readings with respect to subjects' ranges of motion. Data analysis for study group variance was conducted by way of ANOVA testing.

Conclusion: Our proposed study seeks to develop methods for reproducible isolation and characterization of SCM physiological response to active, voluntary contraction as well as passive loading of the muscle via externally applied guided range of motion force application. Additionally, it will focus on the variable neck physiologies observed from patients with atlantooccipital (AO) and atlantoaxial (AA) joint somatic dysfunctions. This procedure would quantify the range of motion, muscle activation, and force production of the SCM before and after osteopathic manipulative treatment (OMT). It could also play a role in describing the muscle energy force threshold necessary for OMT success as a function of a subject's baseline measurements. Further clinical and educational application arising from the results of this study include a more complete description of applied therapeutic forces in OMT of the neck, as well as providing insight into better understanding the distribution of forces in muscles targeted in other treatment techniques.

ABSTRACT #206

COMPARING THE RECOVERY RATES OF CARPAL TUNNEL RELEASE ON NON-DIABETICS AND DIABETICS (WITH AND WITHOUT SMALL FIBER NEUROPATHY)

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Introduction: The carpal tunnel is a passageway in the wrist consisting of 9 flexor tendons and the median nerve covered by the transverse carpal ligament. The median nerve originates from cervical nerve roots (C6-T1) and courses down the arm through the carpal tunnel to innervate the sensory component of digits 1-3 and the medial half digit 4 as well as 3 thenar muscles and 2 lumbricals. Carpal tunnel syndrome is a common condition affecting about 50 cases per 1000 subjects in the general population. Carpal tunnel syndrome occurs when there is compression of the median nerve caused by inflammation of the the synovial sheath leading to symptoms of pain, numbness, tingling and weakness of the hand muscles. In order to treat carpal tunnel syndrome, a surgeon makes an incison at the transverse carpal ligament, releasing the compressed median nerve and alleviating symptoms. Additionally, diabetic patients with peripheral neuropathy are at increased risk of poor wound healing due to decreased vascular circulation. In this study, we hypothesize that the outcomes of diabetics with and without biopsy-proven small fiber neuropathy will have poorer outcomes after carpal tunnel surgery than non-diabetics. This research aims to assess the difference in recovery rate of diabetics and non-diabetics after carpal tunnel surgery using multidimensional pain assessments.

Methods: This study was conducted using a retrospective study design. Diabetic and non-diabetic patients that underwent carpal tunnel surgery from 2015-2020 were selected from a hand surgeon's patient database. 45 diabetic patients and 106 non-diabetic patients were randomly selected. Patient outcomes were evaluated using preoperative and postoperative pain scale assessments including: Disabilities of Arm Shoulder and Hand (DASH), Brief pain Index (BPI), Wong Baker, Numeric Pain Scales, and Boston Scientific Pain Scale. Postoperative evaluations were taken 6 months to a year post surgery. Additionally, biopsy-proven small fiber neuropathy was used as a confounding variable in the assessment of diabetic patients recovery rates.

Results: The results of the study show that non-diabetic patients had a greater healing rate than diabetic patients when comparing all five assessments. The numerical pain scale for non-diabetics improved by 64%. Wong-Baker scores improved by 58%, DASH score improved by 19.2%, BPI improved 42%, and the Boston Pain scale improved by 47%. In comparison, the diabetic population numerical pain scale had a 51% improvement, Wong-Baker assessment improved by 28%, DASH improved by 12%, BPI improved by 27%, and the Boston Pain scale improved 7%.
Of the 22 biopsies taken from diabetic patients, 12 were positive for small fiber neuropathy and 10 were negative. When comparing diabetics with biopsy-proven neuropathy to diabetics without neuropathy, the healing outcomes are increasingly better for diabetics without neuropathy. The difference in numerical and BPI assessments using initial and subsequent measures, for both biopsy proven neuropathy and without neuropathy, are about the same: 3.00 and 3.02 for numerical, and 16.6 and 17.2 for BPI. The greatest improvement in non-diabetics without neuropathy was seen in Baker, DASH, and Boston scales with differences between initial and subsequent assessments at .188, 5.17, and .486 respectively. Diabetics with biopsy proven neuropathy have improvement in healing outcomes as well; however, not as much as the non-diabetics. The Baker, DASH, and Boston scale difference between initial and subsequent assessments were the following: 1.93, 16.89, and .725.

Conclusion: In conclusion, the recovery rate of non-diabetics is significantly greater than diabetics after undergoing carpal tunnel surgery. Additionally, the diagnosis of biopsy-proven small fiber neuropathy limits the recovery rate of diabetic patients.

ABSTRACT #207

TINEA CORPORIS MASQUERADING AS A DIFFUSE GYRATE ERYTHEMA: CASE REPORT AND A REVIEW OF ANNULAR LESIONS MIMICKING A DERMATOPHYTE SKIN INFECTION

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Introduction: Tinea is a superficial fungal infection of the skin. Gyrate erythemas are reactive conditions that present as annular red lesions. A 61-year-old woman was diagnosed with tinea corporis whose skin lesions morphologically mimicked a gyrate erythema. She presented with diffuse annular plaques affecting the left side of her chest and abdomen that did not respond to a combination antifungal-corticosteroid cream for six-month duration. The appearance and clinical differential diagnosis included a gyrate erythema.

Results: Initial evaluation of the skin biopsy from the lesion's edge demonstrated a spongiotic dermatitis, and staining for fungal organisms was negative. However, deeper sections and a different fungal stain revealed hyphae in the stratum corneum and established a diagnosis of tinea corporis. The PubMed database was used to review the following terms: tinea corporis, gyrate erythema, and tinea incognito. Relevant papers and references cited in those papers that were generated by the search were used. Tinea corporis, especially if previously treated with topical corticosteroids, can masquerade as other dermatoses including a gyrate erythema.

Conclusion: Correlation of clinical presentation and pathology findings is essential, especially if the biopsy results do not confirm the suspected clinical diagnosis. Consideration to perform deeper sections or additional special stains or both should also be entertained when the initial pathology observations do not support the presumptive diagnosis based on clinical morphology and history.

ABSTRACT #208

OPERATIVE RECONSTRUCTION OF SYMPTOMATIC RIB NONUNIONS AND OUTCOMES

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Introduction: There is a paucity of literature on the reconstruction of rib nonunions, nor any clear consensus on treatment. The purpose of this study is to assess the outcomes of patients after rib nonunion reconstruction using plate and screw fixation augmented with autogenous iliac crest bone graft.

Methods: Between January 2007 and August 2019, 25 consecutive patients with 51 painful rib nonunions were treated for non-united rib fractures. Patient characteristics/demographics, mechanism of injury, and number of rib nonunions were recorded. Postoperative radiographs were assessed for union. An author-derived patient outcome questionnaire evaluating satisfaction, patient reported complications, and return to occupation and activity, as well as validated patient-reported general health measures were completed via patient call back.

Results: The average length from injury to surgical rib reconstruction was 25.1 months (range=3-118), (median =12). Follow-up was obtained in 18 of 25 patients (72%) with a mean of 45.6 months (range= 9-139). All ribs operatively reconstructed with iliac bone graft and open reduction and internal fixation (ORIF) went on to radiographic union at an average of 12.3 weeks (range= 8-24) after surgery. Sixteen of 18 patients (89%) reported satisfaction with surgery and 15 (83%) reported mild to no pain at final follow up. Among the 16 patients for whom occupation data is available, 12 returned to their original occupation and 4 did not due to reasons other than their reconstructive surgery. For general health surveys, the mean mental and physical component PROMIS scores were 55.9 and 48.7, respectively, and mean mental and physical component SF-36 scores were 52.8 and 45.3, respectively. All scores were within 1 standard deviation of the general US population. Five patients had complications of which 3 were major, although resolved after treatment.

Conclusion: Successful treatment of symptomatic rib nonunion is possible with satisfactory patient reported and radiographic outcomes and with an acceptable rate of complications.

ABSTRACT #209

GREEN NEUTROPHILIC INCLUSIONS AND A NOVEL ASSOCIATION WITH GANGRENOUS ISCHEMIC COLITIS

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Introduction: Bright blue-green inclusions within neutrophils on peripheral smears are both a rare and critical finding. To date, there have been nine reports encompassing 70 documented cases in the literature, all occurring within the last decade. Their presence on peripheral smears initially was linked to various etiologies of acute liver failure due to significant elevations of AST, ALT, ALP, and GTT. In their retrospective study, Courville et al. (2017) proposed tissue injury as the mechanism leading to inclusion formation due to cases without liver enzyme elevation.[1] Initial reports found that patients often expired within 72 hours after the appearance of aforementioned inclusions. The exact composition of these intra-neutrophilic inclusions is unknown. The leading postulation is that they are composed of lipofuscin, while other authors have speculated that they may be made of biliverdin, or even lysosomal degradation products.[1,2] We report a case of gangrenous ischemic colitis with associated blue-green neutrophilic inclusions, in which the patient survived and made a complete recovery.

Methods: Clinical Case Report

Results: The prognosis of these inclusions remains up for debate in the literature. The earliest case reports painted a dismal picture with all three patients expiring within 72 hours of their appearance on peripheral smear. Hodgson et al documented 20 cases, of which 13 patients died. Of the 13 that expired, 12 passed away within 72 hours of identification, further proposing 72 hours as a "critical window" for patient survival.[4] In their retrospective analysis, Courville et al (2017) showed a lower short term mortality rate of 31% compared to the previous 68% found in the literature.[1] Elevated blood lactate levels have been shown to ported a poor prognosis with all patients displaying an arterial lactate > 5/0 mmol/l expiring in prevous reports.[4] Unlike most patients with the appearance of green inclusions on peripheral smears, our patient has made a complete recovery**.** Several authors have suggested etiologies of acute hepatic failure such as acetaminophen overdose, vascular hypoperfusion, septic shock, Hepatitis D superinfection, Budd-Chiari syndrome, alcoholism, and cirrhosis as responsible for inclusion appearance.[4-6] Acute liver failure and or elevation of liver enzymes were present in 24 of the first 25 reported cases.[1] However, Courville et al (2017) propose tissue injury, with hepatic injury being one class of tissue injury, as the pathogenic mechanism that causes these inclusions to occur given that they found inclusions in four patients without significant elevation of hepatic enzymes.[1] Our case supports this proposition as the patient presented without significant liver damage due to ischemic colitis This patient had only modest elevation of liver enzymes and alkaline phosphatase thus ruling out acute hepatic failure as an etiology. Several reports have also shown their patients to have comorbid infections at the time of inclusion appearance with associated microorganisms including *E. coli*, *C. diff*, *Enteroccus*, and *Klebsiella pneumoniae*.[1] Our patient also likely had an infection at the time of inclusion appearance given the gangrenous necrosis of his colon**.**

Conclusion: In conclusion, bright-green intracytoplasmic inclusions within phagocytic leukocytes is a rare phenomenon. While previously associated with acute liver failure, our case demonstrates that they can also be seen in ischemic gastrointestinal disorders. Because bright-green inclusions pose an increased risk of mortality, we advocate for more technician and pathologist awareness of this rare finding so clinicians can be warned to prevent possible clinical deterioration. Increased awareness will also lead to increased detection of this rare phenomenon and allow us to further elucidate the pathophysiology behind inclusion appearance as well as their biochemical composition.

ABSTRACT #210

ATYPICAL PRESENTATION OF TAKOTSUBO CARDIOMYOPATHY IN 77 YEAR OLD FEMALE: A CASE REPORT

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Introduction: Takotsubo (stress) cardiomyopathy, also known as "broken heart syndrome," was first discovered in Japan 1990[7]. It is typically characterized by a transient regional systolic dysfunction in the left ventricle, in the absence of coronary occlusion or acute plaque rupture. The typical form and location of this disorder is the left ventricular apex with apical ballooning, however about 20% of the cases are categorized as atypical subtypes occurring in mid-ventricular region[5]. The pathogenesis of this disease is not well understood. Some theories include catecholamine excess, microvascular dysfunction, and coronary artery spasm. This is a rare syndrome, accounting for only 1-2% of patients presenting with acute coronary syndrome, and is more common in women (>age 55) than in men[9]. The clinical presentation of Takotsubo is frequently triggered by extreme emotional or physical stress, such as death of family members, domestic abuse, arguments, surgeries, and devastating changes in life. In an International Takotsubo Registry study, 36% had physical triggers, while 27.7% reported emotional triggers. 7.8% had both physical and emotional triggers[9]. The diagnosis of Takotsubo can be made if all four of the following criteria proposed by Mayo Clinic are met: transient left ventricular systolic dysfunction, absence of obstructive coronary artery disease or evidence of acute plaque rupture, new ECG changes, and absence of pheochromocytoma or myocarditis[9]. Here we discuss an atypical variant of Takotsubo cardiomyopathy in a 77-year-old woman presenting with abdominal pain and STEMI following a laparoscopic surgical hernia repair. Notably, patient also reported recent stressors in her life including death of multiple immediate family members (>3) within the past 6 months.

Methods: We performed a systematic search of literature, journal articles, and peer-reviewed publications related to typical and atypical Takotsubo Cardiomyopathy. Data was obtained through NCBI, PubMed and DynaMed plus search engines. Resources were analyzed from published articles within the past 20 years.

Results: Our patient had clear emotional and physical triggers prior to her Takotsubo event, including the death of several immediate family members within a six-month period, and most importantly, recent surgical repair of hernia within 24 hours of symptoms onset. The patient fulfilled the Mayo Clinic diagnostic criteria for Takotsubo Cardiomyopathy and diagnosis for Takotsubo was made as EKG showed ST elevations in leads III and aVF, left heart catheterization was clear, had both physical and emotional stressors, and echocardiogram revealed inferior wall motion, more specifically mild LVH and preserved EF of 50% with basal hypokinesis of the basal-mid inferior myocardium.

Conclusion: Takotsobu Cardiomyopathy should be considered as a differential diagnosis in post-menopausal females who have evidence of emotional or physical stressors, such as surgery, who present with significant left ventricular abnormalities. Our patient had clear emotional and physical triggers prior to her Takotsubo event, including the death of several immediate family members within a six-month period, and most importantly, recent surgical repair of hernia within 24 hours of symptoms onset. This syndrome can present intra and post operatively, so any patient presenting with signs of coronary artery syndrome or cardiac arrhythmias in these situations should be worked up accordingly. Efforts made to decrease the physical stressors or catecholamine surges during operation, by appropriate sedation during intra and post-surgical care, may help to decrease the chances of a Takotsubo event.

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ABSTRACT #211

THE IMPORTANCE OF RESILIENCE AND REHABILITATION IN PATIENTS WITH METASTATIC SPINAL CORD COMPRESSION: A CASE STUDY

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Introduction: Metastatic spinal cord compression (MSCC) is a debilitating complication for patients who are concurrently experiencing the rigors of cancer. Without urgent diagnosis and treatment, these patients inevitably develop paraplegia or paraparesis leading to further medical complications involved with loss of function. The purpose of this case study is to explore the benefits of resilience and immediate rehabilitation following treatment of MSCC and how these elements can affect quality of life.

Methods: This case presentation was conducted by reviewing a selected patient history involving MSCC, as well as, searching PubMed for relevant literature on diagnosis, management, treatment, and functional outcomes of patients with MSCC. The study addresses the standard management of MSCC with a focus on rehabilitative care.

Results: Prompt detection by magnetic resonance imaging of the entire spine is the golden standard to diagnosis MSCC. Individualized treatment can range from glucocorticoid therapy, pain management, radiation therapy, spine surgery, to specialized rehabilitation. Treatment initialed <48 hours have shown reduction in neurological deficits and a higher return to ambulatory function. Early rehabilitation involving a multidisplinary team should centralized on the patient's goals and psychosocial needs.

Conclusion: Urgent response to signs and symptoms of MSCC with proper diagnosis and treatment can prevent irreversible functional loss. Post-op rehabilitative care is essential to prevent neurological loss of function, autonomy, and motivation. Coordination and collaboration among multidisciplinary providers with special consideration of the patient's goals, fears, and headspace are important factors affecting quality of life.

ABSTRACT #212

LATE ONSET HEARING LOSS IN VERY LOW BIRTH WEIGHT PREMATURE INFANTS: PRIMARILY CONDUCTIVE VS SENSORINEURAL

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Introduction: Neonatal intensive care unit (NICU) infants are at ten times higher risk for early onset sensorineural hearing loss (SNHL) than well nursery infants. The risk factors that predispose NICU infants to early hearing loss could lead to late onset hearing loss (HL). Due to exposure to multiple risk factors, the Joint Committee on Infant Hearing (JCIH) determined infants who required over 5 days in the NICU are considered high risk for late onset HL and should be evaluated by 24-30 months of age. This recommendation requires a high volume of testing and could overwhelm pediatric audiology resources. In particular, very low birth weight (VLBW) premature infants require weeks of NICU services and encounter the greatest exposure to ototoxic conditions. Little information is available regarding the incidence rate of late onset HL among VLBW NICU infants. In Hawaii, the incidence of newborn early HL is higher than the national average. As an archipelago state, Hawaii is geographically isolated and has a relatively small population with limited audiology services. This limitation led Kapiolani Medical Center for Women and Children (KMCWC) NICU in 2010 to create a tiered referral protocol based on stratification of risk factors. This study describes the incidence rate and types of late onset HL in the VLBW NICU infant population and evaluates the efficacy of the tiered protocol.

Methods: This is a retrospective study of post discharge hearing outcomes of VLBW (<1500g) NICU infants admitted to KMCWC in Hawaii from 2003-2015. All VLBW infants were evaluated for HL before discharge, then assessed for risk of late onset HL and referred at discharge for testing at 3-12 months corrected age, accordingly. We compared hearing outcomes in VLBW NICU infants during the pre-protocol time period (2003-2009, n=837) with those in the post-protocol time period (2010-2015, n=715). Annual rates of late onset HL in pre/post protocol periods were compared using t-test. The distribution of types of HL during these periods was evaluated using Chi square analysis.

Results: As a result of the standardized tiered referral protocol, the return evaluation compliance almost doubled from an annual rate of 38% in 2010 to 71% by 2015 ($p<0.0001$). As expected, there was an increased identification of late onset HL from a pre-protocol incidence rate of 2.9% (n=24/837) VLBW infants from 2003-2009 to 8.0% (n= 57/715) in the post-protocol period 2010-2015 ($p=0.003$). Both conductive and sensorineural types of HL were identified in the late onset testing. The incidence rate of late onset SNHL in the pre-protocol period was similar to the post-protocol rate (1.91 pre vs 0.98 post per 100 VLBW infants, NS). However, the detection of conductive hearing loss (CHL) was significantly increased in the post-protocol period (0.96 pre vs 6.85 post, per 100 VLBW infants, $p<0.0001$). In the pre-protocol period the detection rates of SNHL and CHL were similar, however, in the post-protocol period, the rate of CHL was found to be 6.9 times higher than SNHL.

Conclusion: As expected, the standardization of the referral of NICU infants for late onset HL testing at 3-12 months corrected age resulted in a significant increase in the detection rate. Interestingly, the rate of SNHL detection did not change but the rate of CHL exceeded the expected increase based on the number of infants tested. CHL is often reversible and can be treated. Although CHL may not be permanent, if it occurs in the critical period of language development it can interfere with language acquisition. Therefore early detection of premature VLBW infants who have CHL in the first year of life may help provide early intervention sooner and lessen developmental delays.

ABSTRACT #301S

MATERNAL IODINE STATUS INFLUENCING FETAL HEALTH AND ADVERSE BIRTH OUTCOMES IN THE NAVAJO BIRTH COHORT STUDY (NBCS)

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Introduction: Food insecurity is a major issue in Navajo Nation as 43.8% of those surveyed reported being worried about having enough food to feed their families, likely contributing to the purchasing of highly processed foods with low nutritional value. This study aims to address the health disparities that exist in the Navajo reservation regarding iodine intake throughout pregnancy with the final aim of increasing access to a cost-effective iodine rich diet and decrease the risk of adverse birth outcomes. Information on iodine consumption in pregnant Navajo women is sparse, therefore suggesting the need to examine iodine levels in this population to successfully address iodine necessity and prevent potential future deficiencies in the maternal diet. Iodine insufficiency is likely prevalent in pregnant Navajo women due to the low intake of iodine containing foods and multivitamins. Previous studies reveal that iodine deficiency in pregnant women is strongly associated with preterm birth, low birthweight and intellectual impairment. We hypothesize that pregnant Navajo women will have insufficient urinary iodine levels due to inadequate iodine intake, influencing adverse birth outcomes such as low birthweight, preterm birth, and fetal neurodevelopment.

Methods: This is an Institutional Review Board (IRB) approved longitudinal NBCS examining iodine status throughout pregnancy in Navajo women through surveys and measurements of urinary iodine concentrations. Women were enrolled from February 2013 to June 2018 during their first trimester. Socioeconomic and prenatal vitamin information, such as usage and brand name, was collected during enrollment. Urine samples at enrollment, delivery, and in the baby up to five years of age were gathered and analyzed using Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Maternal urinary iodine concentrations of Navajo women were compared to those of pregnant women in the general U.S. population as a control. Birth outcomes such as low birthweight, premature birth, and Appearance, Pulse, Grimace, Activity, and Respiration (APGAR) scores were collected from medical records. Urinary iodine concentrations were evaluated to identify low, normal or high iodine levels. The relationship between birth outcomes and urinary iodine status was analyzed using statistical methods.

Results: Data collection relevant to our hypothesis remains incomplete, however, urine samples were obtained and iodine concentrations were measured from NBCS fathers, mothers, and babies. Our data suggests that the number of urine collections analyzed from mothers at enrollment is different from the number of samples at delivery, likely due to pending childbirth or withdrawal from the study. Differences in urine samples at delivery for mother and baby is probable due to difficulties in collecting newborn urine.

Conclusion: This study highlights the significance of maternal iodine for healthy fetal development. Future directions should explore nutritional knowledge pertaining to iodine requirements during pregnancy, shopping location, access to affordable iodine rich foods, and iodized salt use among Navajo women. Future health initiatives should involve physician education on the importance of an iodine rich diet in women of reproductive age and iodine containing multivitamin use should be confirmed during prenatal visits in Navajo Nation. Overall, the main goal is preventative medicine focused on individualized care, ensuring that women are iodine sufficient before conception to increase the likelihood of favorable birth outcomes.

CANCER PREVENTION IN THE PASO DEL NORTE REGION: ASSESSING HPV KNOWLEDGE AND VACCINATION RATES IN A MAJORITY HISPANIC COMMUNITY

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Introduction: The human papillomavirus (HPV) infects 14 million new individuals each year, with approximately 79 million men and women affected at any time. Because of the high prevalence of HPV, and the association of this virus with multiple types of cancer, administration of the HPV vaccine is of the utmost importance. Resistance to vaccination comes from diverse sources including changing vaccine and dosing parameters, concerns about vaccine safety, and the affiliation of the virus with sexual activity. The El Paso borderplex region is an interesting exemplar, as it has the highest HPV vaccination rate in Texas and one of the highest in the United States. Vaccination rates drop significantly after administration of the first dose, however, and health disparities exist in this region regarding HPV-associated cancers. Among the many factors influencing these observations, the attitudes and practices of healthcare providers play an important role. Thus, the goal of this study was to determine knowledge and beliefs about HPV, the vaccine, and cancer among current and emerging providers as well as the general public in the majority-Hispanic population of this region. Our hypothesis was that providers in training or in practice would demonstrate higher levels of understanding about the vaccine and the links between HPV and cancer, but their vaccine recommendation practices would vary and contribute to reduced uptake in the community.

Methods: An anonymous survey was deployed to assess community knowledge, attitudes and practices regarding the HPV vaccine and HPV-associated cancers. The survey was developed from a previously-validated instrument, with modifications to account for specific demographics and the current climate associated with the SARS-CoV-2 pandemic. All methods were approved by the IRB of the University of Texas at El Paso. Mixed-gender participants aged 18-65 were recruited via Facebook; consent and responses were obtained using a secure online format.

Results: Data from 175 community respondents were evaluated; participants were 78% female and 82% Hispanic or Latino/a, representing a wide range of household incomes. Less than 40% of respondents had received the HPV vaccine themselves, while 51% of those with children indicated that their child had been vaccinated. Participants were equally likely to vaccinate their sons as well as their daughters. Healthcare practitioners such as pediatricians or family medicine doctors were identified by 57% of respondents as the most trusted source of information on HPV and vaccines. These individuals were also the most common source of vaccine recommendations (41%). Participant knowledge about HPV was higher than expected, and concerns about vaccine safety and efficacy were mixed but not extensive.

Conclusion: It is evident from our data that the majority-Hispanic population of the Paso del Norte region has a good knowledge base concerning HPV, and high vaccine acceptability. Vaccine uptake could be improved, and understanding about the links between HPV infection and cancer remains to be assessed. Healthcare practitioners are critical contributors in all of these areas, making it imperative that they take time to educate their patients and improve their own skills in patient communication and advocacy. Future efforts will evaluate HPV knowledge and vaccination rates among current and emerging healthcare providers, compared to findings from the general public. We will develop an intervention to improve practitioner-patient communication and facilitate community understanding of HPV-associated cancers in order to improve cancer prevention and reduce disparities in our region. Our results may be utilized to create a model of increasing HPV vaccination among specific groups or on a national level.

ABSTRACT #303S

A PROPOSED STUDY TO INVESTIGATE THE EFFECTS OF COVID-19 QUARANTINE ORDERS ON COMMUNITY HOSPITAL EMERGENCY DEPARTMENT USAGE IN NEW MEXICO

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Introduction: Prior to the COVID-19 pandemic, the emergence of unique viruses and the occurrence of natural disasters have greatly impacted the mental and physical health of people across the world. The CDC reports that nationally, emergency department (ED) visits declined 42% during the early COVID-19 pandemic. While southern New Mexico was relatively spared from COVID-19 during these early stages of the pandemic, a state-wide stay-at-home order issued on March 23, 2020 likely affected people's ability and/or willingness to seek acute care. This is important because national trends indicate that the incidence of certain conditions requiring emergency care have remained relatively stable over the past several years. There is minimal research available on emergency department usage during situations like the COVID-19 pandemic. The purpose of this study is to investigate how COVID-19 has affected emergency department usage in southern New Mexico, especially as it relates to health conditions not expected to be affected by quarantine. We hypothesize that the COVID-19 pandemic and subsequent quarantine orders meant to stop the spread of the virus resulted in decreased emergency department usage in community hospitals in southern New Mexico, which could have significant long-term consequences due to delays or lack of treatment for certain diseases and conditions.

Methods: Data will be collected on adult patients who visited the emergency departments associated with hospitals in Southern New Mexico during January – June 2019 (pre-COVID-19) and January – June 2020 (COVID-19) to control for seasonal variation in ED trends. We will collect de-identified demographic and health data, including age, gender, race/ethnicity, primary language, chief complaint, diagnosis (ICD-10), means of arrival at the emergency department, source of payment/ insurance status, and disposition.

Results: Results for this research will be provided upon its completion. The project is currently in the approval process.

Conclusion: It is possible people were not seeking medical care for issues that would typically merit a trip to the emergency department under normal circumstances. It is important to gather data in order to understand both the immediate as well as the long-term consequences of quarantine and stay-at-home orders, including any unintended effects on community health. These data could help hospitals prepare for future waves of infection and future pandemics and devise strategies and methods for continuing to provide quality acute care.

ABSTRACT #304S

DO SOCIAL DETERMINANTS PLACE BARRIERS ON MEDICAL SCHOOL MATRICULANTS?

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Introduction: The medical school application, interview, and admissions process is not a fair one for all qualified applicants. Some of the basic aspects of a system claiming to strive for diversity may in fact systemically impede increasing diversity in medical school applicant pools. Students of socioeconomically disadvantaged (SED) backgrounds may not have the means to enroll in MCAT prep courses, apply to 15+ schools, or fund the cost of traveling to all of the places where they might otherwise be eligible to interview. All these factors may limit an applicant's likelihood of acceptance to a suitable medical school. The current study seeks to inventory the extent to which current medical students feel that their particular social determinants placed barriers in their path to medical school matriculation.

Methods: We examined AAMC and AACOM statistical data, along with prior literature in order to formulate survey questions that will help illuminate how socioeconomic factors impacted a student's prospects when applying to medical school.

Results: We developed a 25-question survey to help us understand the scope of the problem. The first questions ask for background information on race/ethnicity, hometown ZIP code, gender identity, the location and type of medical school they're attending, and an expected year of graduation. The remaining questions ask to what extent the medical application/admission process posed a hardship for applicants and where in the process the students particularly noted limitations to their full participation. These factors ultimately hinder the number of schools students apply to, consequentially reducing their interview invitation prospects.

Conclusions: These survey questions will help document and classify the degree to which current medical students identify barriers of entry in their medical education journey. To the extent that these barriers may prevent diversification of the future physician workforce, this information could help inform efforts to increase participation of more qualified applicants from different socioeconomic backgrounds in the medical school application process.

ABSTRACT #305S

SHORT-TERM TRIAGE AND LONG-TERM PLANNING IN ADDRESSING RECURRENT CYCLES OF INFECTIOUS DISEASE AMONG NEW MEXICO'S NATIVE COMMUNITIES: LESSONS FROM COVID-19

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INTRODUCTION: The Covid-19 pandemic has elevated general public awareness that negative social determinants of health increase the risk of morbidity and mortality in individuals and communities. Nowhere in the US has this been clearer than among the Native American communities of New Mexico (NM), and those of the Navajo Nation which spans parts of NM, Arizona, and Utah. Numerous social factors influence health, and long-term eradication of inequities responsible for putting these communities at high risk will require prioritization. Here we report preliminary findings of our ongoing examination of Covid-19's impact on Native American communities in NM as we attempt to identify the most significant disparities responsible for the disproportionately high toll of this infectious disease among this demographic. Recognition of the most predictive determinants of high risk for infectious disease not only informs current strategies for mitigation in the short term; it is crucial for long-term planning, needed to protect these communities from recurring future cycles of devastation by infectious disease.

MATERIALS AND METHODS: Data were collected from a variety of online resources and subjected to comparisons and statistical tests using JMP (SAS Institute) software to examine temporal trends in Covid-19 positives, tests, and deaths by various NM county characteristics, including: proportion of households below the poverty line; average household size; ethnic composition; household plumbing; high school graduation rates; and others. COVID-19 positive cases, deaths and tests administered, were recorded daily and patterns relating to social variables examined for May 12 through July 3, 2020.[1,2,3]

RESULTS: McKinley, San Juan, and Cibola counties have the highest proportion of population self-identifying as Native American.[4] As of July 3, 2020, the highest *per capita rates* of Covid-19 positives were found in these same counties. McKinley and San Juan report the highest number of households lacking complete plumbing; these, and Cibola, reported the highest number of persons per household and [2] McKinley, the most severely affected by Covid-19, falls within the lowest third of all NM counties for high school completion.[4,5] Least squares analysis yielded a correlation coefficient of .60 between *per capita* deaths due to Covid-19 and *per capita* lacking complete plumbing, for McKinley, San Juan, and Cibola. However, mortality rates did not correlate with households lacking complete plumbing across all NM counties. Comparison of Covid-19 deaths and ethnic composition across all NM counties revealed a strong correlation with proportionately large Native American ethnicity (R^2 = .88) in marked contrast to a lack of fit for Hispanics (R^2 = .26) and Whites (R^2 = .15). A moderate correlation across all counties was found with household size (R^2 = .55).

CONCLUSIONS: New Mexico ranks annually as having one of the highest poverty rates nationally.[6] Two of the same three counties with the highest number of households lacking complete plumbing have recorded the most cases of Covid-19 statewide, as of July 3, 2020. This implies impaired ability to frequently wash one's hands, shower, and launder clothing due to limited access to running water, a situation which magnifies community spread. Based on these initial findings, we caution that usual mitigation models likely do not apply and should be modified for those communities where deficient household plumbing limits the hygienic practices known to control the spread of the disease. Ultimately, a more detailed study of these and additional data, utilizing zip codes for better granularity, is indicated in order to accurately elucidate areas of needed intervention. For the long term, building basic infrastructure to provide every household with plumbing and safe, clean water is essential or history will repeat itself and the next pandemic will again take a disproportionate toll on these communities.

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ABSTRACT #306S

COVID-19 AND CHILDREN: POSSIBLE EXPLANATIONS AS TO WHY CHILDREN HAVE AVOIDED SEVERE COMPLICATIONS

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Introduction: Normally when thinking of an infectious agent, especially one with the potential to cause a pandemic, our first instinct is to protect the high risk or vulnerable populations. Those with compromised or underdeveloped immune systems such as the elderly and children fall within this category. The current COVID-19 pandemic caused by SARS-CoV-2 has deviated from this pattern and children have largely avoided severe complications associated with COVID-19. According to the CDC Covid Data Tracker as of July 3, 2020 individuals under the age of 17 account for only 5.8% of cases and 1.5% of deaths associated with COVID-19. While it is comforting to know that children appear to be at a lower risk for severe complications associated with COVID-19, it presents in interesting question, what makes this virus different? The purpose of this literature review is to investigate possible explanations for children being spared the severe complications associated with COVID-19.

Methods: Electronic searches for peer reviewed articles were performed using the Burrell College of Osteopathic Medicine online library, specifically in PubMed. Different combinations of the following search terms were used in order to locate relevant articles: *COVID-19, SARS-CoV-2, children, epidemiology, ACE2 expression, age, comorbidities, Coronaviridae,* and *immunology.*

Results: Several hypotheses have been proposed to explain the difference in COVID-19 symptom presentation and severity when comparing children to adults. The first being the difference in ACE2 expression, ACE2 has been shown to be the receptor for SARS-CoV-2 and children express significantly less ACE2 than adults. Secondly, children frequently contract different coronavirus strains, specifically those that cause the common cold. It is proposed that a recent coronavirus infection could provide partial immunity to SARS-CoV-2. Thirdly, comorbidities such as obesity, hypertension, and diabetes are associated with increased severity of COVID-19 complications. Children typically have lower rates of these comorbidities than adults and this could potentially contribute to the severity of their symptom presentation. Lastly, the immune system of a child is less developed than the average adult. COVID-19 has been shown to trigger a "cytokine storm" in adults, which means they have an overreactive immune response to the SARS-CoV-2 infection and this can ultimately lead to acute respiratory distress syndrome (ARDS). Children having a less developed immune system could potentially explain why they typically do not experience the "cytokine storm" thereby avoiding severe respiratory damage.

Conclusion: After thorough review of the available data and information related to COVID-19 in children, we believe that it is unlikely only one of the aforementioned hypotheses could explain why children seem to be spared the severe complications associated with COVID-19. It is likely a combination of things that allows them to avoid these severe complications.

ABSTRACT #307

REPEALING THE AFFORDABLE CARE ACT: A META-ANALYSIS OF THE IMPLICATIONS ON BORDER STATE REGIONS

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Objective: To assess the potential effects of repealing the current healthcare policies on access and affordability in the southwest border states.

Introduction/Background: The Affordable Care Act (ACA), or "Obamacare," was enacted in March 2010 with three primary goals: (1) Increase the affordability and availability of health insurance, (2) expand the current Medicaid program to cover adults below the federal poverty level, and (3) support medical care mechanisms designed to lower the costs of healthcare. Although not all states adopted Medicaid expansion programs, the ACA has reduced the number of uninsured Americans. The current White House Administration intends to repeal the ACA with no proposal of alternative solutions, which lends the opportunity for identifying potential effects in Southwestern states.

Methods: This study collected data from publicly available information systems, such as the Centers for Disease Control and Prevention Behavioral Risk Factor Surveillance System, and analyzed demographic and socioeconomic indicators (coverage status, household income, racial profile) three years before and after the ACA's full effect in 2014. Trends were compared to assess potential impacts.

Results/Summary: The New Mexico 2018 census population significantly consisted of Hispanics (47%) and non-Hispanic Whites (36%). From 2011-2013, New Mexico reported an average of 21% of its residents uninsured (national mean 17%), with a third being Hispanic (30%). Within a year of the implementation, coverage rates in uninsured residents declined to 15.40%, with Hispanics remaining to comprise a large percent of the uninsured (24.3%). During this time, the nation's uninsured average dropped to 12.5%.

The Arizona 2018 population consisted of non-Hispanic Whites (60%) and Hispanics (27%). From 2011 to 2013, approximately 22% of Arizona's residents were uninsured; the majority being Hispanics (32.8%, 37.5%, 39.5%). Under the updated policy, Arizona's uninsured percentage rate decreased to 14.4%, with Hispanics being impacted the most (27.7%).

Conclusion: Despite the racial differences in populations, the federal policy in place is evidently effective in alleviating health disparities amongst Hispanics. Reversal of the ACA or raising eligibility criteria can be detrimental to disadvantaged populations. Due to the significant need for health coverage assistance in the Southwest, additional data must be thoroughly analyzed before any further consideration.

ABSTRACT #308

DIABETES IN NEW MEXICO: AN EPIDEMIOLOGIC STUDY TO DESCRIBE INEQUITIES IN DISEASE BURDEN AND SELECTED SOCIAL DETERMINANTS OF HEALTH

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Introduction: New Mexico is a very diverse state, with a population that is 48.8% Hispanic, 38.2% White, 9.1% American Indian/Alaska Native (AI/AN), 2.2% Black/African American, and 1.7% Asian/Pacific Islander (API). It is estimated that close to 50% of the adult population has diabetes or prediabetes. Disparities in health outcomes can be due to inequities of opportunity and resources. The purpose of this descriptive epidemiological study was to describe diabetes-related outcomes by ethnicity in New Mexico and to explore inequities in both diabetes-related outcomes and selected social determinants of health.

Methods: Using existing data on selected health indicators from the New Mexico Department of Health Indicator-Based Information System (NM-IBIS), we accessed publicly available data on the following health indicators: diabetes prevalence and deaths, healthcare access and coverage, poverty, and educational attainment. As is common practice with public health surveillance data, confidence intervals were used as a proxy for statistical significance (i.e., where 95% CI's do not overlap, we considered group differences to be statistically significant).

Results: Diabetes prevalence was highest among AI/AN (20.3%), followed by Black/African American (16.2%), Hispanic (13.0%), API (10.7%), and White (6.7%) populations. Diabetes death rates were highest among AI/AN (71.2 deaths per 100,000 population), followed by Black/African American (43.1 deaths per 100,000), Hispanic (32.1 deaths per 100,000 population), API (19.9 deaths per 100,000), and White (17 deaths per 100,000 population) populations. The percentage of adults 18-64 years old without health insurance was highest in Hispanic (18.3%), followed by Black/African American (11.6%), AI/AN (9.6%), White (8.0%), and API (7.7%) populations. Poverty rates between racial/ethnic groups differ greatly. AI/AN have the highest poverty rate (33.6%), followed by Hispanic (24.8%), Black/African American (24.2%), White (12.4%), and then API (10.4%) populations. The percentage of adults over 25 with no high school diploma was highest in the Hispanic population (24.6%), followed by AI/AN (20.4%), API (14%), Black/African American (9%), and White (5.3%) populations. We also examined differences in diabetes death rates by health insurance status at the census tract level and by educational attainment at the census tract level. Our results are consistent with the substantial body of research documenting the relationship between diabetes indicators/outcomes and racial/ethnic inequities in social determinants of health including poverty, educational attainment, and healthcare coverage.

Conclusions: In New Mexico as well as in the U.S., substantial differences across a range of health outcomes exist between racial/ethnic groups; these differences are due in large part to inequities in social determinants of health. Differences between racial/ethnic groups are evident in all of the social determinants we examined. Interventions that improve social determinants of health and change the context to support healthy behaviors have the largest effect on population health. We hope our findings will be useful for healthcare and public health professionals and other stakeholders in New Mexico as they develop tailored interventions at individual, organizational, community, and public policy levels.

ABSTRACT #309

BENEFITS AND BARRIERS TO HEALTHCARE ACCESS UTILIZING TELEMEDICINE SERVICES AT NORTH SHORE COMMUNITY HEALTH

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Introduction: Our study aims to identify potential benefits and concerns regarding use of telemedicine and if there are any differences between groups, i.e.age, primary language spoken, medicated assisted treatment patients in access of remote care i.e. internet access, device capabilities, etc. This research was conducted at North Shore Community Health (NSCH), a community health center that serves a medically-underserved, diverse population.

Methods: The survey was conducted over phone via Doximity for patients who are registered at NSCH. We compiled a list of all completed appointments booked at the clinic from April 1st to April 30th, as well as current patient lists from June 9th to June 17th. For non-English speakers, a translation service provided by Pacific Interpreters was used. Answers were transcribed using a Google Form which were then collated into a Google Sheet. A chi-square test was performed to determine the statistical significance between groups (ex: age, MAT vs. non-MAT patients, and language) for each question with a 1-sided $p<0.5$. The open-ended answers were analyzed, divided into categories and labeled with a code. The coded-open ended data was then plotted into a pie chart labeling the frequencies of perceived benefits and concerns regarding use of Telemedicine.

Results: Of the factors compared to patient language spoken, access to internet or data, the mode of conducted telemedicine visit, and the presence of technical difficulties during telemedicine visits were found to be statistically significant (p-values:0.003, 0.009, and 0.0001). Also, of the participants who were not native English speakers, 21% felt being a non-native English speaker affected their use of telemedicine services. Of the factors compared to patient language spoken, access to internet or data, the mode of conducted telemedicine visit, and the presence of technical difficulties during telemedicine visits were found to be statistically significant (p-values:0.003, 0.009, and 0.0001). Comparing the factors to MAT patient status, the presence of technical difficulties during telemedicine visits was the only factor found to be statistically significant (p-value: 0.006). When compared to age, factors that were found to be statistically significant were access to internet or data, mode of conducted telemedicine visit, presence of trust of the use of telemedicine services, and presence of a desire to use telemedicine again in the future (p-values: 0.0001, 0.008, 0.0002, 0.000000002). The perceived benefits of telemedicine services included: 32.2% increased accessibility, 10.7% time saved on travel, 9.1% preference as a means to receive non-emergent care, 8.3% overcoming barriers to transportation, and that telemedicine allowed them to remain safe from the COVID-19 pandemic. Percieved concerns to telemedicine are: preference for in-person visits. 15.2% lack of the ability to conduct a physical exam by telemedicine, 5.4% privacy concerns, 3.3% trust with telemedicine, 1.1% language barriers, and 42.9% had no concerns.

Conclusion: The data shows that a majority of the patients generally prefer in-person visits and that they find these remote visits to be more accessible. Other benefits included saving time to travel to the clinic, saving time other life obligations, such as work or family, the ability to receive non-emergent care, avoiding barriers to transportation to the clinic, and avoiding the risk of contracting COVID-19. In terms of potential barriers across different language groups, we found that Internet access disproportionately affects non-English speaking groups. Also looking holistically at the data, we found that more patients were using telephonic visits in comparison to video visits. This calls for further research into potential barriers for patients in using video calls in the future.

PRESENTATION AWARDS

Recipients of the Medical Student Research Day Presentation Awards will be determined by the judging criteria listed below. The Medical Student Research Day Awards include:

- Biomedical Research
  - 1st Place will receive a $250 award
- Clinical/OMT Research
  - 1st Place will receive a $250 award
- Population and Public Health Research
  - 1st Place will receive a $250 award

JUDGING CRITERIA

The purpose of a poster exhibit is to clearly communicate and convey the significance and major points of the research project to a wide variety of audience members. Oral presentations will be scored out of 30 possible points, and will be judged according to the following criteria:

- Quality of abstract
- Content of presentation
- Depth of knowledge of student presenters
- Organization of content
- Delivery and clarity of presentation
- Ability to respond to questions

COMPETITION JUDGES

Biomedical Sciences Research:

- **Kristin Gosselink, Ph.D.**
  Associate Professor, Physiology
  Burrell College of Osteopathic Medicine

- **Nancy Minugh-Purvis Ph.D.**
  Professor, Anatomy and Cell Biology
  Burrell College of Osteopathic Medicine

- **Michael E. Woods, Ph.D.**
  Associate Professor, Pathology
  Burrell College of Osteopathic Medicine

Clinical Sciences and OMT Research:

- **Pedro Del Corral, M.D., Ph.D.**
  Assistant Professor, Pathology
  Burrell College of Osteopathic Medicine

- **Robert Goldsteen, D.O., F.A.C.P.**
  Chair of Clinical Medicine
  Professor, Internal Medicine
  Burrell College of Osteopathic Medicine

- **Joanne Ray, D.O., F.A.A.P.**
  Adjunct Assistant Professor, Clinical Medicine
  Burrell College of Osteopathic Medicine

Population & Public Health Research:

- **Joseph N. Benoit, Ph.D.**
  Professor, Physiology and Pathology
  Associate Dean for Research
  Burrell College of Osteopathic Medicine

- **Harald Stauss, M.D., Ph.D.**
  Associate Professor, Pharmacology
  Burrell College of Osteopathic Medicine

POSTER JUDGING RUBRIC

Title:_____

Presenter(s): _____

Standards	5 - 4 Exemplary	3 - 2 Satisfactory	1-0 Unacceptable
Abstract	Abstract is well written, strongly represented the student's research. Clearly supported topic presented and contained important points.	Abstract is marginally written, somewhat able to see connection of abstract to research/presentation. Abstract did not contain sufficient information.	Abstract is poorly written, unable to clearly connect abstract to research poster or presentation.
Content	Strong material. Well summarized. Clearly shows development of study or research. Material appears to accurately support purpose of study, hypothesis, or research question. Strong conclusion and implications presented.	The content was adequately presented but support for the study, research hypothesis, or question(s) is somewhat general. Conclusion and implications were reasonable.	Connection not found between poster content and purpose of study, research hypothesis/question(s), method, conclusions, or implications.
Depth of knowledge	Demonstrates substance and depth; is comprehensive; shows mastery of material, main points were clearly presented.	Covers topic; shows marginal/adequate mastery and is objective; main points were adequately presented.	Does not give adequate coverage of topic; poor mastery of subject, main points were poorly presented.
Organization of content	Presentation is strongly ordered and easy to follow; visual elements (if any) are clearly arranged and synchronized with presentation.	Presentation order and clarity is of acceptable quality; slightly difficult to follow; visual elements (if any) are somewhat arranged and synchronized with presentation.	Presentation order and clarity of transitions is of poor quality or below; visual elements (if any) may be difficult to follow or out of synch with the presentation.
Delivery and clarity of presentation	Has natural delivery; modulates voice; is articulate; projects enthusiasm, interest, and confidence.	Has appropriate pace; has few distracting mannerisms; is easily understood.	Is often hard to understand; has voice that is too soft or too loud; has a pace that is too quick or too slow; demonstrates several distracting mannerisms.
Ability to respond to questions	Demonstrates full knowledge of topic; explains and elaborates on all questions.	Shows ease in answering questions but does not elaborate.	Demonstrates little grasp of information; has undeveloped or unclear answers to questions.

Judge:_____ Grand Total _____

Thank you for attending our 3rd annual Medical Student Research Day

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