



**REGIONAL MEETING**  
**NOVEMBER 5, 2016 – COLUMBIA UNIVERSITY MEDICAL CENTER**

**ABSTRACTS – POSTER PRESENTATIONS**

**SORTED BY POSTER BOARD #**

**Learning Anatomy by cadaveric and virtual tools: perception of medical undergraduates**

**Tanbira Alam**<sup>1</sup>, S M Niazur Rahman<sup>1</sup>, Lubna Shirin<sup>2</sup>, Afsana Jesmin Alim<sup>3</sup>, Mohammed Shahjahan Kabir<sup>2</sup>, Mahmudul Mannan<sup>4</sup>: <sup>1</sup>Faculty of Medicine, AIMST Univ., Kedah, Malaysia; <sup>2</sup>Faculty of Medicine, QUEST International Univ., Perak (QIUP), Malaysia; <sup>3</sup>Bangladesh Medical College, Bangladesh; <sup>4</sup>Holy Family Red Crescent Medical College, Bangladesh

The anatomical wet lab has become a debatable way of teaching due to limited availability of cadavers, ethical and financial concerns. We aimed to assess students' perceived effectiveness of learning anatomy through cadaveric and virtual setting. After obtaining ethical approval, a pretested questionnaire was distributed among the students of MBBS year 1, 2 and 3. Out of those 250 (110, 69 and 71; from year 1, 2 and 3 respectively) had completed and returned the instrument. The dissection (61.6%) was on top of hierarchy followed by virtual methods (21.6%) and specimens /models (20.4%) as their preferred way of learning anatomy. For basic anatomical understanding majority (58.4%) of our participants had chosen the cadaveric methods. However, the virtual tools were preferred by the students to learn clinical anatomy (53.4%) as well as to facilitate their deep learning (57.6%). Analysis revealed significant ( $p < 0.004$ ) inclination of the female students towards simulation. Most of the student (91.2%) had disagreed on the total shift away from dissection halls towards multimedia labs. Besides, they have stressed on real anatomy as the best practice and suggested for blending both the methods to achieve the benchmark. While the digital labs could enhance some aspects of anatomy learning, yet the dissection remains essential. At a final point, integration would be ideal since both the resource perceive to add value for majority of the learners.

**Level of First Author: Postdoc**

**Topic Category: Anatomy Education**

**Poster Board # 1**

**Anatomic Body Painting as a Teaching Tool in Physician Assistant Education: A Qualitative and Quantitative Assessment**

**Cynthia Bennett**; Dept. of Physician Assistant Studies, Elon Univ., Elon, NC

**Purpose:** To assess student acceptance of Anatomic Body Painting (ABP) as a teaching method and the effect of ABP on test scores in a physician assistant (PA) anatomy curriculum. ABP is used as a teaching tool in many countries but is relatively unknown in the United States. Minimal research exists on academic use of ABP. The high cost of anatomy labs, limited availability of cadavers, and short timeline of many health care curricula make ABP an attractive resource.

**METHODS:** ABP was utilized in the Elon University PA curriculum during instruction of neck and musculoskeletal (MSK) anatomy. Study participants completed a qualitative Likert-format survey and a content quiz on the anatomic region studied, with half of students taking the quiz before the ABP session and half after. Chi Square analysis was utilized.

## RESULTS:

- With 31 participants during neck anatomy, ABP compared favorably to gross dissection in its perceived effectiveness and its acceptance. ABP was found to make participants less uncomfortable physically and/or psychologically than gross anatomy. Quiz scores in the post-ABP test group averaged 11.7% higher than in the pre-ABP test group ( $p < .02$ ).
- Of 32 students assessed during MSK painting, qualitative responses were similar to those in the neck portion of the study but test results were not statistically different after the ABP session (3% increase,  $p > .05$ ).

DISCUSSION: ABP is an excellent adjunct to anatomy instruction and well accepted by students. This study is limited by small size and inclusion of only one testing center.

*Research was conducted without research funding.*

**Level of First Author: Faculty**

**Topic Category: Anatomy Education**

**Poster Board # 2**

### **Preclinical Cadaver Dissection for the Physician Assistant's Surgical Rotation**

**Melissa A. Carroll**, Wayne Stuart; Division of Healthcare, DeSales Univ., Center Valley, PA

The Physician Assistant's (PA) role on a surgical unit can be varied based on subspecialty, clinical setting and availability of the healthcare team. Preclinical training, for an entry-level PA, should prepare the student to apply anatomical knowledge and clinical skills to the assessment of patho-anatomic disease or a surgical case during their clinical rotations. It is our belief that traditional anatomical training, through the use of cadaveric dissection, contributes to the student feeling better prepared for their surgical rotation. The analysis of course evaluations from a cohort of students trained with anatomical software compared to students trained with cadaver dissection permitted this unique comparison. Student responses revealed a significant difference between the cadaver trained cohort (CT) and the software trained cohort (ST) regarding perceived preparedness for the operating room ( $p < 0.01$ ) and other clinical rotations ( $p < 0.01$ ). Furthermore, the ST cohort, significantly more than the CT cohort ( $p < 0.05$ ) felt that access to the cadaver lab during clinical rotations would have enhanced their experience. Overall the CT group, when compared to the ST group, rated their preclinical anatomical training more positively for preparing them for their clinical year.

**Level of First Author: Assistant Professor**

**Topic Category: Anatomy Education**

**Poster Board # 3**

### **Naming the Dead: What information do we get and what do we share with our students?**

**Cope JM<sup>1</sup>**; Precht M<sup>2</sup>, Hannah MC<sup>1</sup>, Bennet CC<sup>2</sup>; <sup>1</sup>Dept. of Physical Therapy Education, Elon Univ.; <sup>2</sup>Dept. of Physician Assistant Studies, Elon Univ.

To quantify information provided to Physical Therapy (PT) and Physician Assistant (PA) anatomists about cadavers they teach with and what information is then shared with students.

In anatomy education the student-cadaver relationship is touted as fostering professionalism and supporting the development of caring health practitioners. With holding identifying information about cadavers is thought by some to be respectful of the deceased and protective of students, and by others to be quite the opposite. The researchers seek to establish a baseline of what cadaveric demographic information is provided to anatomists and then what is shared with students.

Directors of all accredited PT ( $n=217$ ) and PA ( $n=199$ ) education programs were sent an email asking them to forward a survey to the program anatomist.

Study participants were asked to note the number of cadavers and what demographic information they received and then shared with students.

Descriptive statistics were used to report survey responses.

Response rate 47% representing 44 states. Of 138 PT/PA programs responding to the demographics questions, 97% receive some non-identifying information: cause of death and/or age, while 41% of programs are provided with first name, and 37% with last name.

These anatomists routinely share cause of death (90%) and age (88%), with students. First name (34%) and last name (14%) are less frequently shared.

PT/PA anatomists are provided with demographics they don't necessarily share with students. This may be a personal or professional choice, it may be related to confidentiality, or the decision may be directed by the source of the cadavers. Further research is warranted into the reasons PT/PA anatomists do not share donor demographics with students.

*This research was conducted without research funding.*

**Level of First Author: Faculty**

**Topic Category: Anatomy Education**

**Poster Board # 4**

### **Creating a Master List of neuroscience topics for pre-clinical medical education**

**Douglas J. Gould**, Valerie Osula, and Gustavo Patino; Oakland Univ. William Beaumont School of Medicine, Rochester, MN

The objective of the current project is to describe the process by which neuroscience course content is selected in a highly-integrated, clinically-focused, systems-based curriculum. With newly conceived integrated systems-based curricula, where students get increased clinical exposure starting with year one, this often means less time spent covering foundational science principles. It is in this light that decisions on what material is necessary to prepare students for neurology clerkships and for performance on the United States Medical Licensing Examination (USMLE), must be made. In other words, it is no longer possible to 'cover it all' before starting the clinical phase of medical education. In order to determine course content in a structured and deliberate way, the faculty at the Oakland University William Beaumont School of Medicine (OUWB) was divided into 16 Discipline Teams. One of the tasks charged to each Discipline Team was to develop a Master List of topics that must be covered at some point in the pre-clerkship phase of medical school. The creation of a Master List is a critical first step in creating, implementing and evaluating any systems-based integrated curricula. Neuroscience course content on Moodle (course management system) was evaluated against the Master using an iSEEk word count, indicating the course covered 88% of topics. The First Aid (FA) books are the most widely used board preparation materials; their content was similarly evaluated, the books covered 83% of topics. Areas in the OUWB neuroscience course that may be lacking were identified and will be programmed in for subsequent iterations of the course.

**Level of First Author: Faculty**

**Topic Category: Anatomy Education**

**Poster Board # 5**

### **Making Histology Laboratory Fun & Exciting**

**Richard Lindquist**, M.D.; Univ. of Connecticut School of Medicine, Farmington, CT

Engaging students in the microanatomy/histology laboratory experience has been problematic. In order to increase student motivation & engagement, game-like elements and mechanics were introduced into the laboratory. Such gamification is not to be confused with game based learning (GBL.)

The starting point for gamification of the histology laboratory was the virtual microscopes that were used in the laboratory. A web-based student response (a.k.a., clicker) system, which was called Histogame, was developed so students could respond to questions about real time notations made by the preceptor on the virtual histology slides. Software was developed to cumulatively maintain and store to database student responses to the questions. Algorithms gave more points for quickly answered correct answers. With each gamified interaction, students were given immediate feedback. Students could see their individual accumulated points/scores and their ranking within the laboratory on leader board at any time. After prizes & ribbons for high scores and certificates to all for successful participation were awarded at semester end, student attitude toward gamification was evaluation by anonymous Likert survey, which revealed very favorable student attitudes to Gamification. Both before and after gamification student performed very well on course ending examination, thus there was no observed improvement in the already high student scores.

**Level of First Author: Faculty**

**Topic Category: Anatomy Education**

**Poster Board # 6**

### **An Interactive Simulation Model to Improve the Students' Ability to Visualize Movement**

**Erica R. Malone**, M.S., Jinsil Hwaryoung Seo, M.F.A., Ph.D., Michelle Pine, D.V.M., Ph.D., Brian Smith, M.F.A.; Dept. of Visualizations & Dept. of Veterinary Integrative Biosciences, Texas A&M Univ., College Station, TX

Current study aids for gross anatomy (illustrations, cadavers, physical models, and dissection videos) are useful for learning the structure names and locations, but they lack the ability to demonstrate movement. Our research team hypothesized that student interaction with a kinetic model would facilitate better understanding of basic biomechanics. Our team created a physically based kinetic simulation model of the canine pelvic limb that provided student interaction via a computer interface. A muscle name was typed into the computer, then the model demonstrated that muscle's action. In order to test the model (ease of use, student engagement, learning) undergraduate students enrolled in a biomedical anatomy course were separated into two groups, control (no model interaction) and interactive (direct model use). All students were tested over their knowledge of pelvic limb muscle actions at the beginning of their lab period (pre-quiz). Both groups retook the quiz after the lab covering the pelvic limb (post quiz). Post quiz scores for the interactive group were significantly higher than the control group and students reported the model was overall beneficial. *Funding for this project was provided by the Visualizations Dept. Graduate Committee Mini-Grant Program and the Creative Anatomy Collective Program Funded by the Tier One Program at Texas A&M University, and was been approved by the Institutional*

**Level of First Author: Graduate Student**

**Topic Category: Anatomy Education**

**Poster Board # 7**

### **Assessment of Interprofessional Stereotypes Following a Near-Peer Teaching Experience in the Anatomy Lab**

**Anna Murphy-Buske**<sup>1</sup>, Patricia Alfaro<sup>2</sup>, Sandie Larouche<sup>2</sup>, Nickoo Merati<sup>1</sup>, Geoffroy PJC Noël<sup>1</sup>, Nicole M Ventura<sup>1</sup>;

<sup>1</sup>Division of Anatomical Sciences, Dept. of Anatomy and Cell Biology, Faculty of Medicine; <sup>2</sup>Ingram School of Nursing McGill Univ., Montreal QC, Canada

Beyond their clinical rotations, healthcare students have few opportunities to interact with members in other domains of the health field. Furthermore, stereotypes exist within and between healthcare disciplines that can negatively impact interprofessional communication and collaboration in the clinical setting. While the anatomical sciences remain a common field of study for healthcare disciplines, strategies that utilize the anatomy laboratory as a setting to minimize negative attitudes have yet to be well characterized. Medical and nursing students from McGill University participated in a bidirectional, near-peer teaching activity where each discipline had the opportunity to take on the principal role of tutor and tutee. Perceived stereotypes were assessed quantitatively using the Attitudes to Health Professionals Questionnaire (AHPQ). Qualitative methods involved a debrief session following the near-peer teaching activity. Survey results demonstrated minimal changes in the pre- and post-survey responses from the medical students. These results may be attributed to low medical student participation in completion of the survey. However, nine of the twenty attributes assessed using the AHPQ demonstrated significant changes with respect to the response of nursing students on the medical profession. Overall, responses from the nursing students demonstrated a more positive post-survey result for attributes such as empathy, approachability and valuing team-work. These results demonstrate that by establishing a relevant setting for shared education, negative stereotypes among healthcare professionals in training may diminish, allowing for effective and collaborative care to predominate in the clinical setting.

**Level of First Author: Graduate/Medical Student**

**Topic Category: Anatomy Education**

**Poster Board # 8**

### **What are the Trends, Demographics, and Economics in Sports-related Pediatric Spinal Cord Injuries?**

**Vidushan Nadarajah**, Dean Perfetti, Julio J. Jauregui, Qais Naziri, Hiroyuki Yoshihara; Dept. of Orthopaedic Surgery and Rehabilitation Medicine, SUNY Downstate Medical Center, Brooklyn, NY

Pediatric spinal cord injury (PSCI) is a devastating injury that can cause significant long-term consequences. The purpose of this study is to report on the prevalence of PSCI, identify risk factors for sports-related PSCI, and evaluate associated factors. The data sets of the Healthcare Cost and Utilization Project (HCUP) Kids' Inpatient Database (KID) from 2000 to 2012 were analyzed using ICD-9-CM external cause of injury codes to identify the

mechanism of injury contributing to PSCI hospitalization. Demographic data was collected on each admission, and we further stratified by sports-related cases of injury.

Of our study population, 0.8% had a documented diagnosis of spinal cord injury (SCI). The most common documented external cause of injury code was motor vehicle accidents, representing roughly half of all mechanisms of injury in 0 to 9 year olds ( $p < 0.001$ ). PSCI due to sports as an external cause of injury was more relevant in 10 to 17 year olds, and was especially prevalent in the 10 to 13 year old age category in which sports-related PSCI reached a high of 26.0%. Risk factors for traumatic PSCI after a sports-related external cause included older age, male sex and white race. When compared to non-sports related PSCI, the sports-related external cause of injury cohort had a length of stay estimate that was 20.3% shorter (18.0% - 22.6%) and total hospital charges that were 23.6% less expensive (21.7% - 25.6%).

Although relatively rare, injuries to the spinal cord in pediatric patients can result in devastating physiologic, psychosocial, and economic consequences. Given the popularity of youth sports in the United States, parents and sports officials must be made aware of the increased risk of sports-related PSCI among adolescents.

**Level of First Author: Medical Student**

**Topic Category: Anatomy Education**

**Poster Board # 9**

### **Space for Well-being: Understanding How Humans Shape Architecture and Why Where We Live Shapes Us Anatomically**

**Laurice D. Nemetz**; College of Health Professions, Lienhard School of Nursing, Pace Univ., Pleasantville, NY; Anatomy Trains<sup>®</sup>, Walpole ME

Morphogenesis is concerned with how biological form is created. Humans have created and shaped their environmental space since the beginning of civilization. In turn, where we choose to live and the environment we create influences wellness on an anatomical level. Whether living in a city block or participating in a communal folk dance, the structure of the surrounding space reinforces a larger cultural environment, which impacts the individual. Bipedalism changed the shape of our ilium, but environment, from mountainous terrain to the stagnant office space, also impacts our anatomy. Using concepts from movement theorist Rudolph Laban (1879-1958), human movement can be looked at as occurring in a range of four main categories: 1) Direction (direct or indirect) 2) Weight (heavy or light) 3) Speed (quick or sustained) and 4) Flow (bound or free). The author used a review of literature to explore how preferences in these categories helped bipedalism develop in relationship to environment and where different uses of human architecture and public space encourages or discourages the use of different combinations of these efforts.

High load on the skeletal structure occurs during walking and posture, and myofascial connections organize through a variety of movement stressors. Wolf's Law dictates that bone adapts to load. In modern architecture and spatial planning, there is a preference for efficiency of space for the electronic environment while resulting in a limitation of natural stressors needed to organize the body system. Use of natural environment or creative spatial planning can continue to challenge the human form in a positive way.

**Level of First Author: Adjunct Assistant Professor**

**Topic Category: Anatomy Education**

**Poster Board # 10**

### **Self-Directed Dissection Enhances Application of Anatomical Knowledge**

**Gina M. Sorrentino**, Robert V. Hill, Zeinab Nassrallah, and William Rennie; Dept. of Science Education, Hofstra Northwell School of Medicine, Hempstead, NY

Integrated medical curricula emphasize the application of basic sciences to clinical contexts encountered in medical practice. Likewise, the development of skills in self-directed learning is of key importance in professional formation. During the first year at the Hofstra Northwell School of Medicine, students participate in self-directed, case-based dissection projects, each culminating in a presentation to peers and faculty. Students independently research the basic and clinical science of the assigned case, developing goals and learning objectives to be addressed with their dissection. Groups then plan and carry out a detailed prosection of the relevant anatomy, which becomes the focus of an interactive presentation. Faculty members evaluate 12 criteria of these presentations and provide feedback. Cases were assigned three times during the year, with students showing

significant improvement of evaluation scores each time. Here we discuss results in four categories: (1) logical sequencing with effective transitions, (2) proper use of medical terminology, (3) understanding of the dissection and its applications, and (4) integration of dissection into the presentation. Statistically significant improvements in these categories indicate self-directed anatomical presentations improve general presentation skills and use of terminology, enhance understanding of the application of anatomical dissection, and stimulate integrated thinking about anatomy in a clinical context.

**Level of First Author: Assistant Professor**  
**Poster Board # 11**

**Topic Category: Anatomy Education**

### **Comparing Outcomes and Complications Following Primary Reverse Shoulder Arthroplasty in Rotator-Cuff Arthropathy and Fracture Patients: A Meta-Analysis**

Vidushan Nadarajah<sup>1</sup>, Julio J. Jauregui<sup>1</sup>, **Shahla Powell<sup>1</sup>**, Joseph P. Scollan<sup>1</sup>, S. Ashfaq Hasan<sup>2</sup>; <sup>1</sup>Dept. of Orthopaedic Surgery, SUNY Downstate Medical Center, Brooklyn, NY; <sup>2</sup>Dept. of Orthopaedics, Univ. of Maryland Medical Center, Baltimore, MD

The classic indication for reverse shoulder arthroplasty (RSA) is rotator cuff tear arthropathy. Recently, severely comminuted proximal humerus fractures have also become a popular indication for RSA. Multiple factors influence the outcomes of RSA, such as patient characteristics, indications for surgery, implant design, surgical approach and technique, and postoperative rehabilitation. Although many studies have evaluated RSAs, the exact outcomes and complication rates are undetermined.

Hence, we attempted to determine (1) the overall improvement in functional outcomes, (2) the complications, and (3) revision rates for this primary RSA. After stratifying these into the most common indications (cuff arthropathy versus fracture), we (4) determined the complications more commonly observed within each indication and (5) the differences in range of motion. To the best of our knowledge, this study evaluated the largest cohort of RSAs described in literature. When stratifying by fracture or cuff arthropathy, we found a trend towards higher notching rates in the cuff arthropathy cohort, whereas the fracture cohort trended towards higher rates of developing HO and tuberosity related complications. Patients who undergo RSA due to fracture may have decreased external rotation, whereas those undergoing RSA due to cuff arthroplasty may have decreased shoulder abduction.

**Level of First Author: Medical Student**  
**Poster Board # 12**

**Topic Category: Anatomy Education**

### **Internationalization of medical education – A pilot study for building international collaboration by using a common digital dissector and international peer-to-peer student interaction in the Clinical Gross Anatomy course**

**Anette Wu**, MD, MPH, PhD<sup>1</sup>, Camilla Goelkel<sup>2</sup>, Codruta Chiuзан, PhD<sup>3</sup>, Jimmy Duong MS<sup>3</sup>, Heike Kielstein MD, PhD<sup>2</sup> & Paulette Bernd<sup>1</sup>, PhD; <sup>1</sup>Dept. of Pathology and Cell Biology, College of Physicians and Surgeons, Columbia Univ., New York, NY; <sup>2</sup>Institut fuer Anatomie und Zellbiology, Medizinische Fakultät, Universitätsklinikum Halle, Martin-Luther- Universitaet, Halle, Germany; <sup>3</sup>Dept. of Biostatistics, Mailman School of Public Health, Columbia Univ., New York, NY

Background: Internationalization of medical education is important at a time of globalization and can occur on several levels.

The purpose of this pilot study was to address internationalization of medical education in the Clinical Anatomy course in two areas - on the student level via early peer-to-peer communication and on the teacher level via international exchange of teaching material.

Material and Methods: In the current pilot study we a) applied real-time videoconferencing during the Clinical Gross Anatomy course to connect junior medical students from Germany and the US and b) tested a US written digital iPad operated Anatomy dissector at a medical school in Germany. Questionnaires were sent to the students to get feedback on their experience with their international counterparts. Checklists were collected in order to get objective measures for successful adaption of the dissector into the German curriculum. Questionnaires were sent to the users of the iPad dissector.

Results: a) the majority of the students liked the international experience and asked for more sessions, as well as more structured interactions; b) the US written iPad operated dissector was liked by the users and easily adapted into a German Anatomy curriculum and resulted in equal if not better dissection results.

Conclusion: Internationalization of medical education on the student level and teacher's level is possible and welcomed by students. Starting peer-to-peer interaction early in the Anatomy course can give Anatomy a new role in international medical education.

**Level of First Author: Faculty**

**Topic Category: Anatomy Education**

**Poster Board # 13**

### **Sequential Expression of Matricellular Proteins in the Healing of Mustard-Induced Skin Wounds**

**Donald R. Gerecke<sup>1</sup>**, Hui-Ying Chang<sup>1</sup>, Rita Hahn<sup>1</sup>, Chaewon Kim<sup>1</sup>, Kathy K. Svoboda<sup>2</sup>, Marion K. Gordon<sup>1</sup>, Yoke-Chen Chang<sup>1</sup>; <sup>1</sup>Dept. of Pharmacology & Toxicology, Ernest Mario School of Pharmacy, Rutgers Univ., Piscataway, NJ; <sup>2</sup>Texas A&M Univ., Baylor College of Dentistry, Dallas, TX

Sulfur mustard (SM) and nitrogen mustard (NM) alter basement membrane molecules and induce skin blisters. This changes cell adhesion. We hypothesize this may contribute to longer than usual, and improper, wound healing. Matricellular proteins (MPs) help modulate cell-matrix interactions during healing. Their expression and removal is controlled in normal healing. However, they can persist in chronic skin wounds. The timing of MP deposition into the matrix of the provisional wound bed, and its removal from the provisional matrix may play a role in the delayed repair often seen after mustard injury. The basement membrane zone (BMZ) marker, laminin 332 (LM332) and the MPs SPARC, hevin (a.k.a. SPARC-like 1 hevin), and tenascin-C (TNC) were examined over the course of 10 days after exposure of mouse dorsal skin to 5  $\mu$ moles NM. In controls not exposed to NM (i.e., naïve skin), immunofluorescence (IF) analysis of LM332 showed continuous staining across the BMZ, with minimal staining of SPARC, hevin, and TNC. At 1 day post NM-exposure, H & E staining showed characteristic dermal-epidermal separations, and IF showed strong expression of SPARC throughout the BMZ. Hevin was less intense than SPARC, but both were present. TNC appeared in the dermis near the BMZ at this time point. Increased IF levels of hevin were present in the hyperplastic epidermis at 3 days post-NM, as was TNC in the deep dermis. By day 7-10, hevin stained throughout the hyperplastic epidermis. Co-staining of LM332 and hevin appeared in the BMZ using LM332 and hevin antibodies. This sequential deposition of SPARC and hevin in NM injured skin was confirmed by WB data. Overall, MPs in the BMZ of NM injured skin may play a role in the delayed wound repair of vesicant induced injury. *Grant funding supported by ES005022, T32ES007148, and NIAMS U54AR055073.*

**Level of First Author: Associate Professor**

**Topic Category: Cell & Molecular Biology**

**Poster Board # 14**

### **Connexin 43 Antisense Oligodeoxynucleotide (As-ODN) Treatment Alter Provisional Matrix Expression in Nitrogen Mustard Induced Cutaneous Wounds**

**Enoch Yue**, Hui-Ying Chang, Peihong, Zhou, Rita Hahn, Marion K. Gordon, Donald R. Gerecke, Yoke-Chen Chang; Dept. of Pharmacology & Toxicology, Ernest Mario School of Pharmacy, Rutgers Univ., Piscataway, NJ

Nitrogen Mustard (NM, Bis(2-chloroethyl) methylamine), a skin blistering agent, induces a strong inflammatory-stress response, delayed wound healing, and often results in extensive scarring. Studies showed that Cx43 antisense oligodeoxynucleotide (As-ODN) topical treatment accelerates wound closure and re-epithelialization in diabetic skin wounds. Mice deficient in Cx43 show improved wound repair and modulation of the extracellular matrix. If the down regulation of Cx43 accelerates re-epithelialization, it may modulate the provisional matrix and promote wound repair. A time course study (up to 10 days) of NM exposed hairless mouse (SKH-1) skin with treatment of Cx43 As-ODN was performed. Tenascin-C (TNC, an anti-adhesive glycoprotein), and fibronectin (FN, a cell adhesive glycoprotein), were examined. The RNA of murine back skin was extracted and was converted into cDNA by reverse transcription. PCR was performed to insure cDNA quality. Gene expression assays with Taqman probes targeting TNC and FN were performed by Real-Time PCR. H&E histology showed characteristic time dependent NM induced skin wounds. After treatment with Cx43 As-ODN, apparent acceleration of re-epithelialization and wound healing progression was observed. The mRNA gene expression analyses indicated elevated expression of TNC and reduced expression of FN in NM injured skin samples, compared to the

unexposed control samples. After the treatment with CX43AS-ODN, we saw a down-regulation in TNC expression and an upregulation of FN expression in the NM plus Cx43AS-ODN treated group, compared to NM exposure alone. This suggests that treatment using Cx43 As-ODN may play a role in modulating the provisional matrix in NM induced skin wound repair. *Grant funding supported by ES005022, T32ES007148, and NIAMS U54AR055073.*

**Level of First Author: Undergraduate Student**

**Topic Category: Cell & Molecular Biology**

**Poster Board # 15**

**Bones of Collagen XXIV Null Mice Have a Disorganized and Smaller Growth Plate than Age Matched Wild Type Mice**

**Peihong Zhou<sup>1</sup>**, Eric Ziyao Lu<sup>2</sup>, Rita Hahn<sup>1</sup>, Donald R. Gerecke<sup>1</sup>, Francesco Ramirez<sup>3</sup>, Marion K. Gordon<sup>1</sup>;

<sup>1</sup>Pharmacology and Toxicology, Ernest Mario School of Pharmacy, Rutgers Univ., Piscataway NJ; <sup>2</sup>Dept. of Biology, The College of New Jersey, Trenton NJ; <sup>3</sup>Pharmacological Sciences, Orthopaedics and Medicine and Cardiology, Icahn School of Medicine at Mount Sinai, New York, NY

Collagen XXIV is fibrillar type of collagen that is a component of bone. Because its function is unknown, we generated collagen XXIV knock out (KO) mice, and compared their bones to those of wild type (WT) mice of the same ages. MicroCT analysis indicated that the KO mouse femurs were less mineralized. Histology of bone sections showed the growth plate was smaller in the KO mice. At 5 months of age, the wild type mouse growth plate contained a physis of uniform thickness that stained light blue (amphophilic), and was composed of cartilage with regular columns of chondrocytes perpendicular to the physis. Secondary spongiosa continued from the primary as eosinophilic lamellar bone. However, in the KO mouse growth plate, the columns of chondrocytes were shorter, and the cells within the columns appeared to be less organized. Fewer chondrocytes became hypertrophic and fewer appeared to be developing into osteoblasts. No detectable differences were seen in articular cartilage, cortical bone or the bony trabeculae in the marrow cavities. *Supported by NIEHS P30ES005022 and T32ES007148*

**Level of First Author: Research Assistant**

**Topic Category: Development & Growth**

**Poster Board # 16**

**Case Report: Anterotracheal Right Common Carotid Artery with Retroesophageal Right Subclavian Artery**

**Noah Becher<sup>1</sup>**, **Nayoung Koh<sup>1</sup>**, Salvatore A. Rizzo<sup>1</sup>, Sushama Rich<sup>1</sup>, Sumathilatha Sakthi Velavan<sup>1</sup>, Eric W. Baker<sup>2</sup>;

<sup>1</sup>Dept. of Anatomy, Touro College of Osteopathic Medicine, New York, NY; <sup>2</sup>Dept. of Basic Science and Craniofacial Biology, New York Univ. College of Dentistry, New York, NY

During routine dissection of an 83-year-old female cadaver, an unusual origin of the right common carotid artery was found. It arose as a direct branch of the aortic arch and ascended obliquely to the right, crossing anterior to the trachea inferior to the thyroid gland. After crossing the trachea, it resumed its normal anatomic course as it ascended into the neck. Subsequent branches of the aortic arch were as follows: left common carotid, left subclavian, and right subclavian arteries. The right subclavian artery followed a retroesophageal course, the most common path of an aberrant right subclavian artery (ARSA). A particularly striking phenomenon observed was the presence of severe right scoliosis, along with leftward displacement and axial rotation of the aortic arch and its branches. An ARSA can cause subclavian steal syndrome, tracheal or esophageal fistula, and in rare cases, an aneurysm. It is also commonly associated with a right non-recurrent laryngeal nerve, which, if damaged during surgery, can cause dysphonia or dyspnea. An anterotracheal right common carotid can cause severe bleeding in procedures of the neck. Scoliosis-induced compression of the thoracic cavity can further complicate aortic arch variations by introducing tension and malposition of vessels and visceral structures of the thorax. Physicians need to be aware of these risks before performing invasive procedures of the infrahyoid region. *Research support provided by Touro COM Department of Anatomy.*

**Level of First Author: Medical Student**

**Topic Category: Gross Anatomy**

**Poster Board # 17**

### **An Aberrant Right Subclavian Artery - A Case Report**

**Errica Capossela**, Amber E. Pinson, Sumathilatha Sakthi Velavan; Dept. of Anatomy, Touro College of Osteopathic Medicine, New York, NY

The aberrant right subclavian artery (ARSA) is an embryologic remnant of the right dorsal aorta. It occurs in up to 2% of people, making it the most common variation of the aortic arch. The ARSA variation is commonly associated with other vascular anomalies, most often a common carotid trunk, an aortic arch diverticulum, and an ARSA aneurysm. Though the majority with ARSA remains asymptomatic, potential complications include dysphagia lusoria, dyspnea, and retrosternal pain. The purpose of this case report is to add to the findings of previous studies on ARSA and its embryological origin, providing knowledge in clinical anatomy and aiding physicians to be more aware of its possible complications. A dissection was performed of the mediastinum on a 94-year-old female cadaver as part of the gross anatomy lab. After removal of the heart and lungs, students were looking for the thoracic duct when an ARSA was discovered. It emerged as the last branch of the aortic arch and followed a retroesophageal course, crossing the midline between the levels of T3-T4, then angled upward to enter the right subclavian triangle. Clinicians should consider including an ARSA on their list of differentials if patients present with any of the previously mentioned symptoms. Children often present with dyspnea, dysphagia and/or increased respiratory infections due to tracheal laxity. Dysphagia is most commonly found in older adults, often secondary to vascular aneurysms or atherosclerosis of the ARSA, which increases the pressure against the esophagus.

**Level of First Author: Medical Student**  
**Poster Board # 18**

**Topic Category: Gross Anatomy**

### **Aberrant Origin of the Azygos Vein with the Absence of Hemiazygos and Accessory Hemiazygos Veins**

**Marcus L. Konner**, Diksha Gupta, Ramona F. Baez, Sushama Rich, Sumathilatha Sakthi Velavan, Carlos I. Quinteros, Bedia Castellanos; TOUROCUM, New York, NY, Dept. of Anatomy, Touro College of Osteopathic Medicine, New York, NY

The azygos venous system supplies collateral circulation between the inferior vena cava and superior vena cava. This case report describes the findings of a highly tortuous azygos vein that arises from the left renal vein, with an absence of the hemiazygos and accessory hemiazygos veins. Embryologically, it's postulated that the supracardinal vein remained patent caudally permitting origin of the azygos vein from the left renal vein. Furthermore, there are appreciable osteophytic growths apparent on the vertebrae causing a tortuous azygos vein. The entire azygos venous system is engorged due to the increased pressure endured embryologically from the absence of the hemiazygos and accessory hemiazygos veins. Resources: During routine dissection of the thorax, it was observed that the azygos venous system of a 76- year old male cadaver arises from the left renal vein and there was an absence of hemiazygos and accessory hemiazygos vein. Description: After dissection and removal of the thoracic and abdominal viscera, we identified and documented the variations of the azygos venous system of the cadaver. The azygos vein originated from the left renal vein at L3 crossing the midline at the level of T11 and ultimately draining into the superior vena cava between T3 to T4 via the azygos arch. It received drainage of all the posterior intercostal veins from T3- T12 from both left and right side. Significance: The azygos vein is a crucial venous connection in the thorax and therefore, variations in its drainage can have clinical consequences. Knowledge and documentation of aberrant origin and varicosity of the azygos venous system is of clinical significance in avoiding misdiagnosis of a potentially benign vascular anomaly. *T. Kutoglu, M. Turut, N. Kocabiyik, H. Ozan, and M. Yildirim. Anatomical analysis of azygos vein system in human cadavers. Romanian Journal of Morphology & Embryology, 53:1051–1056, 2012.*

**Level of First Author: M.S, Osteopathic Medical Student 2<sup>nd</sup> Year**  
**Poster Board # 19**

**Topic Category: Gross Anatomy**

## **A comparison of Thiel and phenol-based soft-embalmed cadavers for reconstructive, ENT and orthopedic surgery training**

**Geoffroy PJC Noel**, Gabriel Venne, Michelle L. Zec; McGill Univ., Montreal, Canada

Surgical skills training requires practice in conditions that resemble those in vivo. Practice on standard formalin embalmed cadaveric specimens has traditionally been limited as it does not provide a realistic model. The aim of our study was to compare the utility of using Thiel and phenol-based soft-embalming (Floppy) cadavers for reconstructive, ENT and orthopedic surgery training.

**Methods:** Three Floppy and 3 Thiel cadavers were investigated. The 18 participants (6 experienced ENT and reconstructive surgeons and 12 orthopedic and reconstructive surgery residents) were asked to evaluate aspects pertaining to the quality of different tissues, the visual and haptic properties as well as the usability for 10 specific reconstructive, ENT and orthopedic surgical approaches. In parallel, a histological investigation of the structural properties of the skin was performed using H&E and Masson's Trichrome staining.

**Results:** All participants rated the Floppy specimens consistently better or equivalent to Thiel for all of the parameters evaluated. The Thiel's method was observed to have softening effects compared to Floppy.

Histological studies confirmed that the integrity of the skin was better preserved in the Floppy's method.

**Conclusions:** Floppy cadavers provide as realistic of a model as Thiel cadavers for a wide range of surgical training skills. It preserves the integrity of the skin tissue better which has implications for the practice of surgical exposures, simulated reconstructions and wound closure. Moreover, floppy specimens can be prepared for a third of the cost and with none of the elaborate setup required for Thiel embalming.

**Level of First Author: Faculty**

**Topic Category: Gross Anatomy**

**Poster Board # 20**

## **Distal Femoral Condyles Diameter in Bangladeshi Population**

**S M Niazur Rahman**<sup>1</sup>, Lubna Shirin<sup>2</sup>, Zar Chi Thent<sup>3</sup>, Mohammed Shahjahan Kabir<sup>2</sup>, Tanbira Alam<sup>1</sup>, Mahmudul Mannan<sup>4</sup>; <sup>1</sup>Faculty of Medicine, AIMST Univ., Kedah, Malaysia; <sup>2</sup>Faculty of Medicine, QUEST International Univ., Perak (QIUP), Malaysia; <sup>3</sup>Faculty of Medicine, Universiti Teknologi MARA (UiTM), Selangor, Malaysia; <sup>4</sup>Holy Family Red Crescent Medical College, Bangladesh

In total knee replacement or arthroplasty, the detail measurements of the distal femur had served as vital anatomic landmarks. Implant designed from Western countries causes several complications while it is used in the certain Asian population. The purpose of this study was to determine the morphometry of distal femur in Bangladeshi population and compare it with the same of Caucasians. Three hundred (300) dried femurs acquired from three different medical colleges in Bangladesh were measured and recorded in this study. Values of the femoral condyles were obtained by the digital sliding caliper. No significant differences of femoral bicondylar width, intercondylar depth, femoral medial and lateral condyles width were observed among the study population. However, the femoral medial and lateral condylar width of Bangladesh population ( $34.04 \pm 4.18$ ;  $31.45 \pm 2.37$ , respectively) were found significantly smaller compared to the previously reported Caucasians' measurements. It is believed that revealing the significant difference in femoral condyles morphometry amongst Asian and Western populations could be the important factor which determines the selection and production of suitable implants for knee arthroplasty in the neighboring population. *This research is a self-funded project of the authors.*

**Level of First Author: Graduate Student**

**Topic Category: Gross Anatomy**

**Poster Board # 21**

## **Innervation of the Long Head of the Triceps Brachii**

**Michael Wade**, Arthur McDowell, Janine Ziermann; Howard Univ. College of Medicine, Washington, DC

It is commonly accepted that all heads of the triceps brachii muscle receive motor innervation by the radial nerve. However, traumatic injuries to the axillary nerve were associated with the paralysis of the long head of the triceps (LHT). This indicates that the LHT was innervated by the axillary nerve in such cases. Both, the radial and axillary nerve, are terminal branches of the posterior cord of the brachial plexus. The axillary nerve has an anterior and a posterior branch. The latter emerges at the inferior border of the scapula traversing the quadrangular space,

giving off a branch towards the teres minor, a motor branch to the deltoid and an upper lateral cutaneous sensory branch. From a posterior view the radial nerve can be seen through the quadrangular space but this nerve is not traversing the space. The LHT makes up the medial border of the quadrangular space and inserts at the infraglenoid tubercle of the scapula. Given the spatial correlation of the axillary nerve in the quadrangular space, the insertion of the LHT and the relative distance to the radial nerve in this area, an innervation via the posterior branch of the axillary nerve seems plausible. We will dissect this area in at least ten human cadavers in order to follow the axillary and radial nerves towards their terminal determining branches ending in the LHT. Our results will be relevant for surgical procedures of traumatic nerve injuries and for therapeutic treatment (physical and occupational therapies).

**Level of First Author: Graduate Student**  
**Poster Board # 22**

**Topic Category: Gross Anatomy**

### **The accessory head of the flexor pollicis longus muscle (Gantzer's) in the Puerto Rican Population, and its relationship with the anterior interosseous nerve: A cadaveric study**

**June Yan, Wilson Veras, MD; Dept. of Anatomy and Cell Biology, Univ. Central del Caribe SOM, Bayamón, PR**

In the present study, we examined the accessory head of flexor pollicis longus (Gantzer's muscle) as a potential etiology of anterior interosseous nerve neuropathy. The aim was to describe the accessory head of flexor pollicis longus (ahFPL) and its incidence in the Puerto Rican population. A total of 30 upper limbs from cadavers were dissected in the anatomy laboratory. The ahFPL was identified and origin, insertion, morphology, and innervation were observed. Additionally, the topographical relationship of the ahFPL to the anterior interosseous and median nerve was examined. The incidence of the ahFPL was 15 (50%) of extremities investigated. The origin of the muscle was from the medial epicondyle of humerus in all cases. The insertion was mainly to the tendon of flexor pollicis longus (80%) at different levels. Several morphologies were observed, fusiform (53.3%) and voluminous (26.6%) being the most frequent encountered. The innervation was mostly from branches of the anterior interosseous nerve (86.6%). The ahFPL was anterior to the anterior interosseous nerve and posterior to the median nerve in 93.3% of the cases. This relationship confirms a causative nature of anterior interosseous nerve compressive neuropathy or entrapment by the ahFPL. Moreover, this study demonstrates the presence of this anatomical variation in the Puerto Rican population.

**Level of First Author: Graduate/Medical Student**  
**Poster Board # 23**

**Topic Category: Gross Anatomy**

### **Accessory Brachial Artery – A Unique Variant**

**Sarika J. Ziemann<sup>1</sup>, Aryeh Y Esterson<sup>1</sup>, Sumathilatha Sakthi Velavan<sup>1</sup>, Sushama Rich<sup>1</sup>; <sup>1</sup>Dept. of Anatomy, Touro College of Osteopathic Medicine, New York, NY**

The anatomical variations of arterial patterns of the upper limb are associated with embryological and clinical significance. A unique variant of the brachial artery was observed and is reported due to its rarity. This was a case study that examined the vasculature of the right upper limb during routine dissection of a 57 year old female Caucasian cadaver. Two arteries were observed in the front of the arm. The first artery (accessory brachial artery) was larger, continued from axillary artery, coursed superficial to the median nerve and terminated as ulnar and radial arteries. The second artery (brachial artery) arose at the level of the third part of the axillary artery, was enclosed by the two roots of the median nerve and coursed deep to the median nerve. The posterior and anterior circumflex humeral, two profunda brachii, and superior and inferior ulnar collateral arteries emerged as branches of the second artery. Anastomosis was noted between the two arteries in the cubital fossa. Accessory brachial artery served as the main feeding artery of forearm and hand in this case while the brachial artery terminated after supplying the brachium. Failure of regression of the superficial brachial artery during stage five of embryological development explains this uncommon variant. The knowledge of such a variation is valuable to consider in routine evaluation of angiographic images, and for surgical intervention. *Touro College of Osteopathic Medicine Department of Anatomy provided our source of support.*

**Level of First Author: Osteopathic Medical Student**  
**Poster Board # 24**

**Topic Category: Gross Anatomy**

### **Healing of NM-Induced Blistering is Slower than Equivalent Blister Injury Induced by UVB Exposure**

**Minchang Choi**<sup>1</sup>, Iris P. Po<sup>1</sup>, Rita A. Hahn<sup>1</sup>, Peihong Zhou<sup>1</sup>, Yoke-Chen Chang<sup>1</sup>, Donald R. Gerecke<sup>1</sup>, Kathy K. H. Svoboda<sup>2</sup> and Marion K. Gordon<sup>1</sup>; <sup>1</sup>Ernest Mario School of Pharmacy, Rutgers Univ., Piscataway, NJ; <sup>2</sup>Biomedical Sciences, Texas A&M, Baylor College of Dentistry, Dallas, TX

The US government currently lists vesicants as potential terrorist agents. Sulfur mustard and nitrogen mustard (NM) cause blistering of skin and microblistering of the cornea, severing the connection between the epithelial layers of these organs from their dermal/stromal layers at the level of the basement membrane zone (BMZ). During the Iran-Iraq war, Irani physicians reported that mustard-induced wounds healed more slowly than what was expected for a blister wound. Like NM, UVB blisters separate the basal epithelial cells from their basement membrane zone (BMZ). To heal such injuries, provisional matrix components such as SPARC are deposited into the wound bed to favor the epithelial migration needed for wound closure. To test whether mustard injury truly shows delayed healing, corneal organ cultures were exposed to UVB and NM under conditions that caused 60% epithelial-stromal separation at 1 day post exposure. Repair of the epithelial-stromal junction was followed over the course of 7 days by assessing the separation of the cell layers across the diameter of the corneas at 1, 3, 5 and 7 days post exposure. SPARC expression was examined as a representative member of the provisional matrix in the wound bed. After a ~60% epithelial-stromal separation from UVB, a stratified epithelium attached to the BMZ was almost entirely re-established within 5 days of exposure. NM-exposed corneas took 7 days to establish a monolayer of epithelia attached to the stroma. SPARC removal from the UVB wound bed took 5 days, while the NM-exposed corneas took 7 days to remove most of the SPARC. These results indicate mustard injuries do display delayed healing as compared to equivalent blistering caused by a different vesicant, UVB. *Supported by NIAMSD U54AR055073, NIEHS P30ES005022 and T32ES007148*

**Level of First Author: Graduate/Medical Student**

**Topic Category: Histology**

**Poster Board # 25**

### **Restasis Treatment Reduces Epithelial-Stromal Separation in Nitrogen Mustard-Exposed Corneas**

**Philip Gallo**, Shivani Shah, Minchang Choi, Jason Mango, Erin Choi, Yoke-Chen Chang, Rita A. Hahn, Peihong Zhou, Donald R. Gerecke, Marion K. Gordon; Dept. of Pharmacology and Toxicology, Ernest Mario School of Pharmacy, Rutgers Univ., Piscataway, NJ

Sulfur mustard is a terrorist agent used in WWI, the 1980s Iran-Iraq conflict, and in an attack on Syrians by ISIS in August, 2015. The agent injures the eyes, lungs, and skin. It causes extreme eye pain, tearing, and blepharospasm (uncontrolled blinking), compromising sight. The US government considers SM a potential terrorist agent. Despite its use on and off over the last 100 years, there are no FDA approved drugs available for treating ocular mustard injury. Recurrent corneal erosions are localized epithelial-stromal separations (i.e., microblisters) that can occur in people's eyes after ocular mustard exposure. The same type of injury occurs from overactivity of the immune system in Dry Eye, an ocular disease. Since Dry Eye is treated with the FDA-approved drug Restasis, we tested Restasis on corneas injured by nitrogen mustard (NM). Corneal organ cultures were exposed to NM for 2hr, then split into two groups. One NM-exposed group was treated with 1 drop of medium 2 times over the subsequent 22hr, and the other was treated with 1 drop of Restasis 2 times over the same period. Controls were unexposed corneas and unexposed corneas treated with Restasis. After the 22hr incubation, corneal organ cultures were embedded in OCT, sectioned, and H&E stained to evaluate the histology across the cornea. Naïve corneas and corneas treated with Restasis showed greater than 95% epithelial-stromal integrity. When exposed to NM for 2 hr., at 22 hrs. after exposure, corneas retained only ~50% epithelial-stromal integrity. With Restasis treatment after NM exposure, corneal integrity was improved to ~85%. Restasis should proceed to *in vivo* animal studies as an ocular mustard therapy. *Supported by NIAMSD U54AR055073, NIEHS P30ES005022 and T32ES007148*

**Level of First Author: Graduate/Medical Student**

**Topic Category: Histology**

**Poster Board # 26**

### **Evaluation of Toxicological Effect of African Toad Body Secretions on Kidney of Male Wistar Rat**

**Churchill J. Ihentuge<sup>1,2</sup>**, Godwin C. Ndukwe<sup>2</sup>, Frank C. Akpuaka<sup>2</sup>; <sup>1</sup>Dept. of Anatomy, Howard Univ. Washington DC; <sup>2</sup>Dept. of Anatomy, Abia State Univ., Nigeria

Toad skin and parotid gland secretions are potent source of drugs possessing analgesic, painkiller, antibiotic, anti-viral and anti-cancerous properties as well as potential for treating cardiovascular diseases. Twenty adult Wistar rats, weighing between 100–150g, were used in the study to evaluate the toxicological effects of body secretions from African Bufo Species on kidney of male Wistar rats. They were divided into five groups of four animals each designated as groups A, B, C, D and E. Group A served as Control group and was fed with diet and tap water only. Groups B, C, D and E were fed with standard diet and given a solution made from crystalline extract of secretions from the body of African Toad (orally) at a single dose of 5mg/kgbw, 10mg/kgbw, 15mg/kgbw and 20mg/kgbw respectively (LD50 is 40mg/kgbw). The rats were treated and research conducted in conformance with the FASEB Statement of Principles for the use of animals in research and education. Forty-eight hours after the administration, rats were sacrificed and kidneys dissected out and processed for histological study. Blood was also collected for chemical analysis of renal biomarkers (Urea, Creatinine, electrolytes). Results showed hemorrhage from all the orifices of the body including the urethra from groups C, D and E twenty-four hours after administration. The levels of Urea and Creatinine were significantly ( $p < 0.05$ ) increased in all the experimental groups (B, C, D and E) when compared with the control group (A). The value of Serum Potassium ion in group E ( $6.28 \pm 0.797$ ) was significantly higher ( $p < 0.05$ ) when compared with the control group ( $3.85 \pm 0.25$ ). Macroscopically, the kidneys were hemorrhagic and enlarged. Histopathological changes include infiltration of inflammatory cells, loss of glomeruli, renal tubular necrosis and atrophy in the experimental groups. The pathological changes were more severe in group E and least in group B. The morphology and histology of control group showed normal renal architecture. This showed that African Toad skin and Parotid gland extract is a potent cause of renal damage therefore its clinical use should be evaluated.

**Level of First Author: Graduate/Medical Student**

**Topic Category: Histology**

**Poster Board # 27**

### **Oxytetracycline Reduces Epithelial-Stromal Separation in Nitrogen-Mustard Exposed Corneas**

**Jason Mango**, Shivani Shah, Erin Choi, Minchang Choi, Philip Gallo, Yoke-Chen Chang, Rita A. Hahn, Peihong Zhou, Donald R. Gerecke, Marion K. Gordon; Dept. of Pharmacology and Toxicology, Ernest Mario School of Pharmacy, Rutgers Univ., Piscataway, NJ

Vision is one of our most important senses. Sulfur mustard (SM) is a chemical that can cause temporary, episodic, or permanent blindness. SM was used as a chemical weapon in World War I, the Iran-Iraq war of the 1980's, and was used by ISIS on Syrians in August 2015. Since it is easy to synthesize from cheap components, the US government considers it a potential terrorist agent, and there are no FDA approved therapies to treat the injury it causes. In the eye, mustards cause microblistering at the corneal epithelial-stromal border. When enough microblisters accrue, large areas of the epithelium are shed, leading to pain and impaired vision. Long term vision problems, such as recurrent corneal erosions, can result. Our efforts to understand how mustards affect the cornea have determined that epithelial-stromal separation is a consequence of activation of matrix metalloproteinase-9 (MMP-9). Because MMP-9 activity can be inhibited tetracycline drugs, we tested oxytetracycline (Pfizer) as a therapy for ocular mustard exposure because it is the only tetracycline approved by the FDA for ocular use. Corneal organ cultures were exposed to nitrogen mustard (NM) for 2 hr, then treated 3 times over the following 22 hr with oxytetracycline. Corneas were then embedded in OCT and evaluated by histology. Epithelial-stromal separation was measured with and without oxytetracycline treatment. Our results indicated that, without therapy, NM induced ~52% separation of the epithelium from the stroma at 22 hr post exposure. When oxytetracycline was used as a therapy, separation in NM-exposed corneas at 22 hr post exposure was reduced to 11.3%. This drug shows promise as a therapy for ocular mustard injury. *Supported by NIAMS U54AR055073, NIEHS P30ES005022 and T32ES007148*

**Level of First Author: Undergraduate**

**Topic Category: Histology**

**Poster Board # 28**

## **Anatomic Relationship of the Bifurcation Point of the Dorsalis Pedis Artery to the Length of the First Metatarsal: Surgical Implications**

**Scott B. Hanauer**<sup>1</sup>, Djavlon A. Khakimov<sup>1</sup>, Juan C. Dominguez<sup>2</sup>, R. Shane Tubbs<sup>3,4</sup>, Marios Loukas<sup>4</sup>, Kevin T. Jules<sup>5</sup>, Khurram H. Khan<sup>5</sup>, Anthony C. Dilandro<sup>6</sup>, Anthony V. D'Antoni<sup>7</sup>; <sup>1</sup>Student at New York College of Podiatric Medicine, New York, NY; <sup>2</sup>Student at CUNY School of Medicine, The City College of New York, CUNY, New York, NY; <sup>3</sup>Chief Scientific Officer, Seattle Science Foundation, Seattle, WA; <sup>4</sup>Dept. of Anatomical Sciences, St. George's Univ., Grenada; <sup>5</sup>Division of Medical Sciences, New York College of Podiatric Medicine, New York, NY; <sup>6</sup>Division of Pre-clinical Sciences, New York College of Podiatric Medicine, New York, NY; <sup>7</sup>Dept. of Pathobiology, CUNY School of Medicine, The City College of New York, CUNY, New York, NY

Globally, the current estimated prevalence of hallux valgus is 23% of people aged 18-65 years. Few studies have focused on iatrogenic arterial injury during bunionectomy procedures involving the first metatarsal-medial cuneiform joint (FMMCJ) despite the fact that damage to the dorsalis pedis artery has been a reported complication. The proximity of the dorsalis pedis artery to the first metatarsal was measured to determine a safe area for surgery near the FMMCJ. Methods: Twenty-four feet (12 left, 12 right) were obtained from 12 formalin-fixed cadavers (9 female, 3 male) with mean (SD) age at death of 81.9 (11.4) years. Metatarsal length was measured followed by distance from the bifurcation point of the dorsalis pedis artery to the first metatarsal base using a digital caliper. Summary: Strong positive correlations were found between the right and left first metatarsal lengths (0.988) and bilaterally between the distance from the first metatarsal to the dorsalis pedis artery bifurcation point (0.972). A strong positive correlation (0.793) was also found between first metatarsal length and distance between its base and dorsalis pedis artery bifurcation. Variations were noted and, in some cases, bifurcation of the dorsalis pedis artery occurred at a much shorter distance from the base of the first metatarsal. Conclusions: We found that as the length of the first metatarsal increased, so did the distance from the dorsalis pedis artery bifurcation point to the first metatarsal base. It is important for surgeons to know the safe area by envisioning the vicinity of the dorsalis pedis artery and its bifurcation point to the FMMCJ since these procedures address pathologic conditions of this joint.

**Level of First Author: Graduate/Medical Student**  
**Poster Board # 29**

**Topic Category: Lower Extremity**

## **Reduction of Knee Osteoarthritis Symptoms in a Cohort of Bariatric Surgery Patients**

**Andrea Leyton-Mange**<sup>1</sup>, Thayer Mukherjee<sup>1</sup>, Fernando Bomfim<sup>1</sup>, Evan Wilder<sup>1</sup>, Lauren Browne<sup>1</sup>, Mukundan Attur<sup>1</sup>, Kayleigh Toth<sup>1</sup>, Shira Aharon<sup>1</sup>, Janice Lin<sup>1</sup>, Renata La Rocca Vieira<sup>2</sup>, Christine Ren-Fielding<sup>3</sup>, Manish Parikh<sup>3</sup>, Steven B. Abramson<sup>4</sup>, Jonathan Samuels<sup>4</sup>; <sup>1</sup>Rheumatology, NYU Langone Medical Center, New York, NY; <sup>2</sup>Dept. of Radiology, NYU Langone Medical Center, New York, NY; <sup>3</sup>Dept. of Surgery, NYU Langone Medical Center, New York, NY; <sup>4</sup>Dept of Rheumatology/Medicine, NYU Langone Medical Center, New York, NY

Obesity is a known risk factor for knee osteoarthritis (KOA). We initiated a prospective observational study to evaluate painful KOA in obese patients already planning to have bariatric surgery, and to correlate their weight loss over time with improvements in KOA-related pain and physical function.

Methods: We screened 536 obese patients before they had laparoscopic adjustable gastric banding (LAGB), sleeve gastrectomy, or roux-en-Y gastric bypass (RYGB) at Bellevue Hospital Center and NYU Langone Medical Center. We enrolled interested patients with knee pain who met diagnostic criteria for osteoarthritis. We evaluated excess weight loss (%EWL) at 1, 3, 6 and 12 months after surgery, and we assessed knee pain and function using the Knee Injury and Osteoarthritis Outcome Score (KOOS) at the same post-op intervals.

Results: 307 patients reported knee pain, and 175 met inclusion criteria and consented (89.7% female, mean BMI 43 kg/m<sup>2</sup>±7, range: 32-60, mean age 42 ±11, range: 18-73). Post-op pain improvement from baseline correlated well with %EWL (R = .262, n = 114, p = 0.005 at 12 months), with RYGB and gastric sleeve surgeries yielding a higher %EWL and more improvement than LAGB. Pain scores plateaued after 1 month, while weight loss continued over the course of the year. Radiographic KOA severity at baseline correlated with pre-op pain levels but was not predictive of improvement following surgery.

Conclusion: Bariatric weight loss surgery improves KOA symptoms, and patients with higher %EWL experience greater symptom improvement. A majority of knee symptom relief occurs during the 1<sup>st</sup> month before much weight loss, suggesting a metabolic impact of the bariatric surgeries beyond mechanical load reduction on joints.

**Level of First Author: Medical Student**

**Topic Category: Lower Extremity**

**Poster Board # 30**

### **Lower Extremity Physical Characteristics Relate to Landing Error Scoring System (LESS) Scores in Female Adolescent Gymnasts**

**Shannon Linderman**, Donna Moxley Scarborough, Mia Musseti, Luke S. Oh; MGH Sports Medicine Service, Dept. of Orthopaedic Surgery, Massachusetts General Hospital, Boston, MA

Gymnasts have the highest rates of anterior cruciate ligament (ACL) injury among college athletes, but their physical characteristics that might dictate lower extremity (LE) injury risk remain unexplored (Hootman, 2007). The LESS is a combined score of 17 biomechanical features (at the trunk, hip, knee and ankle) used to assess neuromuscular control and LE injury risk in field athletes. The purpose of this study was to examine the relationship of physical characteristics of the gymnast's lower limb and LESS scores. Fifteen female adolescent gymnasts underwent a LE assessment of quadriceps (Q-angle), hip internal/external rotation (IR/ER) range of motion (ROM), hip IR/IR and ankle inversion/eversion strength via handheld goniometer. Biomechanical video analysis was used to formulate a LESS score from subjects' performance of a box drop vertical jump task. The average LESS score was  $8.23 \pm 2.66$ . LESS scores displayed negative Spearman correlations with dominant lower limb gluteus medius ( $r_s = -0.564$ ,  $p = 0.045$ ) and maximus ( $r_s = -0.583$ ,  $p = 0.036$ ) strength. LESS scores correlate with dominant hip IR ROM ( $r_s = 0.661$ ,  $p = 0.019$ ) and strength ( $r_s = -0.546$ ,  $p = 0.045$ ). Fourteen of the 15 gymnasts had LESS scores within the range of published increased ACL injury risk ( $>5$ ), supporting reports of high incidence of ACL injury among gymnasts (Padua DA, 2015). The significant correlations of gymnasts' LESS values with dominant limb measures suggests a greater reliance on this limb during functional activities. The correlation of LESS to hip rotation ROM and strength suggests that clinicians should screen these physical characteristics and modify training programs, as needed. The LESS may be useful in identifying gymnasts at risk for LE injury.

**Level of First Author: Graduate Student**

**Topic Category: Lower Extremity**

**Poster Board # 31**

### **Relation of Varus Knee Thrust during Walking to Two-Year Incidence of Frequent Ankle, Hip, and Lower Back Pain: The Multicenter Osteoarthritis (MOST) Study**

**Alexandra E. Wink**<sup>1</sup>, Carrie A. Brown<sup>2</sup>, Michael C. Nevitt<sup>3</sup>, Cora E. Lewis<sup>4</sup>, James Torner<sup>5</sup>, Leena Sharma<sup>6</sup>, David T. Felson<sup>7</sup>, K. Douglas Gross<sup>7,8</sup>; <sup>1</sup>Dept. of Anatomy and Neurobiology, Boston Univ.; <sup>2</sup>Dept. of Biostatistics, Boston Univ.; <sup>3</sup>Dept. of Epidemiology and Biostatistics, Univ. of California, San Francisco; <sup>4</sup>Dept. of Medicine, Univ. of Alabama, Birmingham; <sup>5</sup>Dept. of Epidemiology, Univ. of Iowa; <sup>6</sup>Feinberg School of Medicine, Northwestern Univ.; <sup>7</sup>Clinical Epidemiology Research and Training Unit, Boston Univ.; <sup>8</sup>Dept. of Physical Therapy, MGH Institute of Health Professions

Varus knee thrust is an abrupt change in knee alignment observed during gait that has been linked to knee osteoarthritis (OA) and knee pain. Thrust is a dynamic event that likely influences the entire kinematic chain of the lower limb, yet the effects of thrust beyond the knee are unknown. *Our objective was to determine the effects of knee thrust on the 2-year incidence of frequent ankle, hip, and low back pain.* The MOST study is a cohort study of older Americans with or at risk for knee OA. Thrust was assessed from 60 Hz frontal plane videos acquired as participants completed self-paced walking trials over a 4.9 meter walkway. Self-reported frequent pain was defined as "pain, aching, or stiffness on most days in the past 30 days." To assess the relation of thrust to incident pain, we used logistic regression adjusting for covariates and accounting for non-independent limbs. 1375 subjects contributed to the person-based analysis. 2158 knees from 1087 subjects comprised the sample for the limb-based analyses. Varus thrust was observed in 31.3% of knees. Nonsignificant results suggested that knees with thrust may have 1.30 times the odds (95% CI: 0.97, 1.73) of incident hip pain ( $p = 0.08$ ), and that persons with thrust in at least one knee have 1.47 times the odds (95% CI: 0.96, 2.24) of incident low back pain ( $p = 0.08$ ) compared to knees without thrust. No association was found between thrust and incident ankle pain ( $p = 0.22$ ).

While small numbers of incident pain cases may have restricted our ability to detect significant relationships, our findings suggest a possible association between varus thrust and risk of developing hip and low back pain. Further study of the relation of aberrant knee motion to injury at these regions may help explain these findings. *This research was supported by the Rheumatology Research Foundation Health Professionals Research Preceptorship, and by the Multicenter Osteoarthritis Study (NIH/NIAMS).*

**Level of First Author: Graduate Student**  
**Poster Board # 32**

**Topic Category: Lower Extremity**

### **The Effects of Functional Knee Bracing on Lower Extremity Mechanics during a Sprinting Task**

**James A. Yaggie**<sup>1,2</sup>; <sup>1</sup>Human Anatomy Laboratory, Ithaca College, Ithaca, NY; <sup>2</sup> Human Movement Laboratory, Univ. of Findlay, Findlay, OH

The purpose was to investigate the mechanical effects of knee bracing during a sprinting task. Subjects (n=20; 23.1 ± 0.6yrs), were bilaterally fitted with functional knee brace (FKB), prepared and instructed to perform sprinting tasks under motion capture. Three, 25-M sprint trials, across 3 times (unbraced (T1), braced (T2) and a post-exercise braced (T3)), were performed. Prior to T3, a short exercise bout was performed to simulate warm-up. Data were analyzed using RMANOVA (.05). T1 torques were calculated at 1.07 ± 1.6 N/kg/m<sup>2</sup>, 1.32 ± .9 and 1.2 ± 1.2 for the hip, knee and ankle joints, respectively; while (T2) values decreased (.88 ± 1.1, 1.1 ± 1.3 and 1.1 ± 1.3) across all joints (p < .05). Joint torque values at T3 depicted significant increases (p < .05) in hip (1.78 ± 1.8) and ankle (1.77 ± 1.1; compared to T1 & T2), with no changes at the knee (1.22 ± 1.1). A significant decline in speed was observed from T1 (5.22 ± .2 m/s) to T2 (4.94 ± .2), with no significant change in T3 (5.21 ± .1). ROM values at T1 were noted as 45.12° ± 11 , 46.4 ± 13.9 and 19.77 ± 8.1 for the hip, knee and ankle. There was significantly less hip (39.69° ± 14.1) and knee flexion (41.22 ± 16.5) at T2, while the ankle showed no significant change (20.34 ± 11.5). Reductions in ROM, across all joints, were observed during T3 (41.25 °± 9.6, 43.77 ± 10.8, 16.22 ± 10.8). Application of a FKB increased moments at the hip and ankle, while decreasing torque at the knee during the sprinting task. Decreased torque at the knee indicates the application of a FKB may increase stability and decrease excessive motion at the knee, lending to its protective capability. Athletes should consider a comprehensive warm-up immediately after donning the FKB to maximize its restriction with minimal effects on performance.

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