

SECTION IX: HEALTH SCIENCES
Paper Session
Thursday Morning, 9:00 am – 10:40 am
Arthur J. Bond Engineering Building, Room 120
Ronald N. Hunsinger, Presiding

2. 9:00 AM CURRENT DEVELOPMENTS IN THE USE OF ANIMAL MODELS IN HEALTH SCIENCES. *Warren Jones*, Samford University; *Rebecca Jones*, University of Alabama at Birmingham.

A significant number of animal species are used as embryological and physiological models in the health sciences. However, few of these important animal models are fed nutritionally complete diets before or during clinical studies. This review focuses on two representative species: the variegated sea urchin, *Lytechinus variegatus*, and the zebrafish, *Danio rerio*. We will review the development and refinement of prepared diets for these species, and will also discuss our current studies that focus on non-allometric growth metrics to determine dietary requirements.

3. 9:20 AM CADAVERIC DISSECTION IN THE EDUCATION OF HEALTH SCIENCE CLINICAL STUDENTS. *Mark Caulkins*, Nick Washmuth, Brad Cantley, Paul Harrelson, Kathleen Caulkins; Samford University.

For many years, cadaveric dissection has been used in the education and training of students in medicine. We present the rationale for performing and studying dissection of cadavers in the training of future clinicians and offer several interesting anomalies found in the cadavers dissected by students in the Samford University Cadaver Lab, and the UTEP Human Anatomy.

4. 9:40 AM . VIRTUAL DISSECTION: ALTERNATIVE TO CADAVERIC DISSECTION FOR A PREGNANT NURSE *Ronald N. Hunsinger*, Nicholas Washmuth, Terri Cahoon, Katrina Tuggle, Samford University.

5. Anatomy is a cornerstone of health-professional education. In order to obtain enough practice to successfully enter a medical career, deep, hands-on, interactive experience is vital for physicians, nurses, physical therapists, physician assistants, and other health professionals. Dating back more than 2500 years, the use of human cadavers has been the gold standard for such an experience. Using cadaveric dissections in anatomy education allows for various advantages: promotion of active and deep learning, preparation of the student for clinical practice, correlations of structure to pathology, exposure of students to death, and three-dimensional conceptualization of skeleton-muscular, innervation, vascularization, and visceral arrangements. It is a tactile form of learning that allows students to transfer didactic concepts learned in lectures into real, hands-on experiences. However, formaldehyde used in the preservation of cadavers can render the laboratory sessions a health risk. OSHA levels for formaldehyde exposure in gross anatomy laboratories has been set at 0.75 ppm TWA per 8 hrs. Formaldehyde is known to irritate the eyes, nose, throat, and skin, as well as

sensitize the respiratory system. In addition, it is a cancer hazard, especially for the nose, throat, and lungs. It is imperative that formaldehyde levels be monitored using a real-time monitor and that the ventilation system in the laboratory can ensure proper air exchange. However, a literature search indicates that pregnant students should avoid formaldehyde exposure in gross anatomy laboratories altogether, and that other means of laboratory experiences be made available to them. This case study compared exam results of a pregnant student in the Nurse Anesthetists Program at Samford University who completed all her dissections using an Anatomage Table with her 25-student cohorts completing their laboratory requirements in a gross-anatomy class using human cadavers. Within the limited parameters of a case study, the results confirm that significant knowledge gain can occur by utilizing the Anatomage Table for “dissection” just as much as it can occur with dissections on actual cadavers. From these studies, we can conclude that neither method is more or less effective—their effectiveness is dependent on faculty’s ability to teach adequately.10:00 AM

BREAST CANCER DIAGNOSTIC TECHNOLOGIES: TODAY AND TOMORROW. *Donna Cleveland*, University of South Alabama.

Since the earliest days of mammography, radiologists have recognized that the radiographic composition of the breast varies widely between individuals. The ACR BIRADS 5th edition breast composition categories are:

- A. The breasts are almost entirely fatty.
- B. There are scattered areas of fibroglandular density.
- C. The breasts are heterogeneously dense, which may obscure small masses.
- D. The breasts are extremely dense, which weakens the mammography’s sensitivity.

Breast composition is a function of x-ray attenuation, which is when breast tissue absorbs x-rays as they pass through the breast. The absorption of x-rays by tissue as they pass through the breast, knowing this is vital because an appreciation of breast composition can “help indicate the relative possibility that a lesion could be obscured by normal tissue.” Put even more simply, not only does dense breast tissue reduce the sensitivity of screening mammography, it can also be an independent risk factor for breast cancer.

Breast tissue density is a radiological term that refers to the appearance of fibroglandular tissue on the mammographic image. It is the supportive structure of the breast and ductal system. Fatty tissue is virtually transparent to x-rays because it appears black on a mammogram, providing good contrast for cancers (which appear white on the mammogram); fibroglandular (dense) tissue also appears white and therefore can disguise or mimic cancers. Dense tissue presents particular difficulty in that even a small region of high density can obscure a small cancer. An individual woman’s breast tissue density is simply the percentage of her breast that is composed of fibroglandular tissue; a percentage that will vary over her lifetime, increasing and decreasing during periods of childbearing and lactation, and generally decreasing with menopause. Other than age, the largest impacts on breast density in an individual is from changes in body mass index (BMI), hormone replacement therapy, and from tamoxifen or other aromatase inhibitors utilized as breast cancer prevention drugs. Breast

density has also been found to be an inherited condition.

Scientists have long recognized that breast cancers develop primarily in the lobular and ductal systems, and that it is also these systems that cause the mammographic image of a breast to appear dense. Although FFDM materially improved the sensitivity of screening patients with dense breast tissue over analog mammography, research continues to show that sensitivity remains low for patients with dense breast tissue.

Research concerning breast density has evolved to the acceptance that breast tissue density is considered an independent risk factor for cancer itself, rather than just confusing the interpretation of the mammogram. The understanding of high tissue density as a risk factor has reached the level of consensus, with the American Cancer Society (ACS) quantifying the relative risk of breast cancer due to extremely dense breast tissue (BIRADS D) density at 2.1 to 4.0 times the normal risk. Extremely dense breast tissue is ranked equivalent to having one first-degree relative with breast cancer and just behind a personal history of breast cancer or two to three first-degree relatives with premenopausal breast cancers.

The implications of breast density on causal risk continue to be discovered through ongoing lines of research. Breast density has been linked to risk for postmenopausal women sufficient to warn against the use of hormone therapy. Tissue density has been associated with risk of cancer in the contralateral breast for women who have previously been treated for ductal carcinoma in situ (DCIS), and density has been differentiated as a risk factor in cases of lobular involution. As breast density research continues, it is probable that the relationship between tissue density and the fundamental biology of breast cancer will be clarified. Mammography has long been considered the “gold standard” of breast imaging; it is the most accurate and cost-effective method of screening for breast cancer. Mammography has a sensitivity range of 75% to 90%, a specificity of 90% to 95%, and a proven record of decreasing breast cancer-related mortality rates. The combination of mammography screening examinations that find breast cancers in its early stages paired with advancements in treatment, has made it possible for 98% of breast cancers that are found early to be cured.

However, mammography is not perfect. It does not find all cancers. There are some types of cancers that cannot be visualized on a mammogram. Additionally, there is always the possibility of human error-- due to the nature of breast tissue and how it is imaged on a mammogram, it is possible for a cancer to be overlooked by the radiologist, or for a technologist to fail to pull the cancer onto the image. Because of these weaknesses, innovative technologies and methods are consistently being invented to aid radiologists and technologists in performing at an even higher degree of perfection.

This paper will discuss the varying technical modalities that are being researched and applied to patient imaging as an adjunctive study to the mammogram’s ability to obtain an accurate diagnosis.

***u or **g* Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.

SECTION IX: HEALTH SCIENCES

Poster Session

Thursday Morning

Arthur J. Bond Engineering Building, Auditorium

Authors Set-up: Begins at 8:30 am

Authors Present: 11:00 am - 12:00 pm for Viewing and Judging

Ronald N. Hunsinger, Presiding

6. . ANATOMIC VARIANTS IN STUDENT CADAVERIC DISSECTION. *Mark Caulkins*, Nick Washmuth, Brad Cantley, Kathleen Caulkins, Samford University.

Cadaveric dissection has long been a part of the education and training of students in medicine. It allows appreciation of the three-dimensional structure and different textures of the human body. It has particular utility in the education of future clinicians such as surgeons, physician assistants, physical therapists, and occupational therapists. Because of the cost of cadavers, many programs are increasingly using models, including holographic programs. However, one of the advantages of cadaveric dissection is the anomalies found in every cadaver. We present some of the interesting anomalies found in cadavers that were dissected at the Samford University Cadaver Lab and the UTEP Human Anatomy Teaching Laboratory.

7. **g. IMPACT OF A NURSE-LED IMPLEMENTATION OF A FALL PREVENTION TOOLKIT FOR OLDER ADULTS IN A MOBILE IPE COMMUNITY CLINIC: A PILOT STUDY. *Tiffani Chidume*, Auburn University.

Background and Objectives: Falls are costly and one of the most expensive medical conditions to treat. The implementation of fall prevention toolkits (FPTs), such as fall risk screenings and fall prevention education (FPE), have become increasingly important in reducing fall incidences. Nurses will have a greater role and responsibility to care for the aging population. The purpose of this project was to implement a FPT for adults age 65 and older that attended mobile IPE community clinics. Research Design and Methods: This project used a mixed-methods design. The Missouri Alliance for Home Care's ten-question survey and components of the CDC's Stopping Elderly Accidents, Deaths, and Injuries (STEADI) FPE were used to assess and educate participants on fall risks and fall prevention. An initial baseline fall assessment and fall education score was obtained at the mobile IPE clinics. Follow-up assessments occurred one month after the initial assessment and compared to the initial fall assessment and fall education scores with an additional qualitative interview.

Results: In both fall risk assessment tools, lower scores indicated a lower fall risk; both fall risk assessment tools' means decreased over the one-month period. The paired t-tests results were clinically significant as evidenced by the decrease in falls.

Discussion and Implications: Future FPE implementation projects should consider providing resources the participants may need so there is no delay in increasing fall prevention and safety measures. The follow-up time period should also be increased to fortify FPE and keep participants engaged in fall prevention safety.

8. **u . UNPACKING THE C3 LOGIX AND SCAT 5 EVALUATION TOOLS: A LOOK AT HOW CONTACT AND NON-CONTACT SPORTS AFFECT NEURAL

COGNITION. *Greg Jenkins, Samantha Giordano-Mooga, University of Alabama at Birmingham.*

The lab engages in research on the utilization of ketone supplementation post-concussion, to benefit short and long-term function and recovery in adolescents in partnership with Children's Hospital of Alabama. Through the utilization of C3 Logix systems with embedded SCAT 5 concussion protocols, preliminary data was taken in the fall on: a rugby team, an ultimate frisbee team, and a group of non-athletes. The C3 Logix collects data on criteria such as: simple and choice reaction speeds, processing speeds, visual acuity, memory recall, and many other data points. The result of this was a data set with varying results from which many conclusions could be drawn. One of these was a correlation between contact versus non-contact sports and a differing in results within each measured criterion. Criteria such as reaction speed and memory recall varied noticeably between the sports, as well as for the non-athlete students. This difference in results from identical testing for non-contact, contact and no-sport students suggests a potential correlation between the type of sport and neural plasticity and brain function. Although the data is for a limited number of participants, there is enough to begin building a trend that can be compounded upon with the continued collection of this data type. These preliminary, baseline data sets will be incorporated into the larger ketone concussion project to provide another comparison set to establish the efficacy of ketone supplementation on sport-related concussions.

9. ****g IN-VITRO METABOLIC EVALUATIONS OF COMMERCIALY AVAILABLE CANNABIDIOL OIL ON THE METABOLISM OF COMMONLY PRESCRIBED CLASSES OF ANTIDEPRESSANT MEDICATIONS.** *Shelby Holley, Greg Gorman, Marshall Cates, Samford University.*

Purpose: The purpose of this study is to evaluate the effect of commercially available cannabidiol (CBD) oil on the metabolism of various antidepressant drugs. Antidepressant drugs utilize several cytochrome p450 enzyme metabolism pathways which may be affected by the concurrent use of CBD. Effects on drug metabolism may change the drug's efficacy, safety, and clinical therapeutic outcomes.

Methods: Fluoxetine, bupropion, and mirtazapine were tested in-vitro using human liver microsomes with 4 different concentrations of cannabidiol oil, and data was pulled at 3 time points over one hour. Using a mass spectrometer, these metabolic reactions were then analyzed.

Results: All comparisons calculated with bupropion were found to be statistically significant, showing that metabolism of bupropion is largely affected by the addition of CBD oil. Mirtazapine's data also shows that it has statically significant changes in metabolism between all concentrations of CBD oil, except between 10 μ M vs. 5 μ M. These two concentrations of CBD affect the metabolite production very similarly. Lastly, none of the fluoxetine reactions were shown to have statistically significant differences, exhibiting that CBD oil likely has minimal effects on the metabolism of fluoxetine.

Conclusion: This research provides data that can be beneficial for healthcare providers when determining monitoring, treatment, or use of antidepressant medications in a patient who uses CBD products. This evidence shows that high doses of CBD may inhibit the

metabolism of mirtazapine and bupropion, but that fluoxetine metabolism remains mostly unchanged by the addition of CBD.

10. ****u** . ESTROGEN RECEPTOR ALPHA SIGNALING PREVENTS AN INCREASED INFLAMMATORY RESPONSE BY ENCOURAGING DECREASED M1 MACROPHAGE DIFFERENTIATION. *James Boyett, Shannon Lynch, Samantha Giordano-Mooga, The University of Alabama at Birmingham.*

Estrogens, the driving force for female sex characteristics, have dichotomous concentrations throughout the female life cycle, which have been implicated as the driving force for differences in cardiovascular disease rates in pre- and post-menopausal females. To better understand these differences, and the role that estrogen plays in the damaging inflammation corresponding with cardiovascular disease, this lab has investigated the differences in monocyte differentiation into pro- or anti-inflammatory macrophages in both pre- and post-menopausal females with and without menopausal hormone therapy (MHT). Monocytes differentiate into M1 (pro-inflammatory) or M2 (anti-inflammatory) macrophages based on certain environmental stimuli and elicit desired responses. Differences in monocyte polarization were identified in post-menopausal females without MHT, when compared to pre-menopausal females, and said differences were found to be mitigated by the presence of MHT. When investigating the mechanism of estrogen-based differentiation utilizing ER α -KO and ER β -KO mice, it was found that the presence of mitochondria was significantly reduced in ER α -KO mice. These findings suggest a mechanism for monocyte differentiation leading to potentially decreased expression of M1 macrophages in the presence of ER α activation. Better understanding the role of estrogen signaling in inflammation and inflammatory responses will help to better understand the differences in disease incidence in pre- and post-menopausal women.

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