

model. Ultimately, our goal is to establish whether the sensitivity of the bedside swallow examination can be augmented with the addition of an acoustic screen in humans. **METHODS/STUDY POPULATION:** Two excised canine larynges were used for laryngeal phonation simulations under six different conditions over 48 hours. Acoustic recordings were obtained while the larynges were in vibration at the phonation threshold pressure. Phonation was recorded under dry conditions and when the laryngeal introitus was covered with low viscosity glycerin (9.5cP) or high viscosity glycerin (950cP), as well as in adducted and abducted conditions. The latter mimics glottic insufficiency seen in presbylarynx or vocal fold paralysis. **RESULTS/ANTICIPATED RESULTS:** A total of 112 voice samples were generated and analyzed for pitch, sound pressure level (SPL), % shimmer, % jitter, relative average perturbation (RAP), and noise-to-harmonics using PRAAT software. A multivariate regression model showed that pitch, SPL, % shimmer, % jitter and RAP could significantly predict wetness in abducted conditions only. Could you please add numbers and p values? **DISCUSSION/SIGNIFICANCE OF IMPACT:** This pilot study indicates that classic acoustic perturbation measures distinguish the dry from the wet larynx only in glottic insufficiency condition in an ex vivo canine laryngeal model. Our next step is to study whether non-linear time series analysis and machine learning can differentiate dry and wet phonation in both adducted and abducted conditions in our animal model. **CONFLICT OF INTEREST DESCRIPTION:** Dr. Anais Rameau is a co-founder and Chief Executive Officer of MyophonX, a wearable device used to restore speech in patients with limited phonation capacity.

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### Activity and Abundance of Mucus-degrading Microbes in Inflammatory Bowel Disease

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**OBJECTIVES/GOALS:** This study seeks to culture and characterize mucus-degrading microbes from the microbiome of inflammatory bowel disease (IBD) patients. **METHODS/STUDY POPULATION:** Stool will be collected from IBD patients and healthy first-degree relatives, then enriched for mucin-degrading microbes through growth on porcine rectal mucin. Dilution plating in both liquid and solid culture formats will be employed to isolate strains capable of growth on mucin. Cultures that are positive for mucin degradation will be identified with 16S rRNA sequencing; unique isolates will be genome sequenced and transcriptionally profiled on simple monosaccharides and mucin in order to identify putative mucin-degrading genes. The abundance of novel enzymes, pathways, and microbes will be compared in healthy and IBD patient populations using existing datasets in the literature. **RESULTS/ANTICIPATED RESULTS:** We expect to isolate previously uncultured mucin-degrading microbes, which will likely include new strains and possibly new species of bacteria. Through the transcriptomic characterization of mucin-degrading pathways, we will expand the lexicon of known mucin-degrading enzymes and pathways used by bacteria in the human colon. We expect mucin-degrading microbes to be more abundant and active in IBD patients compared to healthy controls. **DISCUSSION/SIGNIFICANCE OF IMPACT:** There is no cure for IBD and treatment relies heavily on suppressing a patient's immune system. This research seeks to understand the contribution of the gut

microbiota in the pathogenesis of IBD, which may lead to future therapeutic targets.

4503

### Adaptation of Motor Action in Children with Hemiplegic Cerebral Palsy

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**OBJECTIVES/GOALS:** We study the association of adaptive decision-making, motor planning, and neuromuscular constraints, in children with hemiplegia. We examine how children scale motor decisions to body mechanics and the distance of a target while reaching in sitting/standing, and if they can recalibrate motor decisions to sudden changes in body mechanics. **METHODS/STUDY POPULATION:** Forty-five 6-12 year-olds with hemiplegia and 45 age/gender matched typically developing controls participate in clinical tests (i.e. balance, visual perceptual skills, etc.) and 3 experiments. Children "reach to tap" toward a target while sitting with both preferred and not preferred arms under three conditions: regular elbow extension sitting and standing and elbow extension range reduced by 50% via a splint while sitting. Trials are easy, ambiguous, and difficult. Motor decisions are compared to abilities and motion sensors (IMUs) worn at wrist, arm, sternum and lumbar area, record biomechanical strategies children use under different decisions. Synchronized video analysis presents biomechanical strategies under different decisions. **RESULTS/ANTICIPATED RESULTS:** Data collection is still underway. A mixed models analysis is used to compare 2 (group: hemiplegic/typically developing) X 2 (arms: healthy/impaired & dominant/non dominant) X 3 (difficulty levels) the children's decisions. Functional analysis is used to capture biomechanical strategies children use under different decisions and levels of difficulty. Exploration strategies are recorded relative to levels of difficulty. We will also compute correlations between affordance thresholds for all children and measures of sensation, range of motion, cognition and balance (in each posture). Lastly, a secondary analysis will compare behaviors of children with left/right hemisphere lesions, as they differ in spatial abilities. Preliminary results show that children with hemiplegia make errors with both their affected and unaffected side. **DISCUSSION/SIGNIFICANCE OF IMPACT:** Motor deficits in children with hemiplegia are the primary focus of treatments. Motor learning interventions focus on biomechanical deficits. Results from these studies expand the focus to planning and cognitive control issues underlying motor deficits.

4212

### An age-dependent, rescuable defect in intestinal barrier repair is associated with an immature enteric glial network in a neonatal pig model of intestinal ischemia

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**OBJECTIVES/GOALS:** An age-dependent restitution defect in our neonatal pig intestinal ischemia model is rescued by unknown factors within homogenized mucosa of weaned pigs. A postnatally

maturing network of enteric glia regulates the epithelial barrier, so we aim to show rescue is due to replacement of glial factors. **METHODS/STUDY POPULATION:** Jejunal tissues from suckling or weaned pigs were assessed by RNAseq and processed for immunofluorescent histology and 3-D volume imaging. Jejunal ischemia was surgically induced in weaned pigs and injured mucosa was recovered ex vivo with or without the glial inhibitor fluoroacetate (FA) while monitoring transepithelial electrical resistance (TER). **RESULTS/ANTICIPATED RESULTS:** Ingenuity Pathways Analysis of RNAseq data revealed significant suppression of numerous pathways critical for epithelial wound healing in suckling pigs (Z-score  $< -2$  for of nine key pathways). Volume imaging studies confirmed lower density ( $P \leq 0.05$ ) and complexity of the subepithelial glial network in suckling pigs. Treatment with FA inhibited TER recovery ( $P < 0.0001$ ) and restitution ( $P < 0.05$ ) in weaned pigs, mimicking the suckling pig phenotype and supporting glia as an important regulator of restitution in our model. **DISCUSSION/SIGNIFICANCE OF IMPACT:** These findings provide important evidence that a developing glial network may be critical to the postnatal development of intestinal barrier repair mechanisms. Ongoing work will explore glial-epithelial interactions *in vitro* to further define postnatal development of barrier repair.

4581

### Autonomic Dysfunction as a Marker of Depression and Coronary Artery Disease

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**OBJECTIVES/GOALS:** Dysfunction of the autonomic nervous system (ANS) may be important in both depression and coronary artery disease (CAD). A novel heart rate variability (HRV) metric, *Dyx*, may be a potentially useful tool to study ANS dysfunction in these diseases. We propose that ANS dysfunction, measured by decreased *Dyx*, will associate with both depression and obstructive CAD. **METHODS/STUDY POPULATION:** We included participants undergoing coronary angiography for suspected CAD. Depressive symptoms were assessed with the Patient Health Questionnaire-9 (PHQ-9). HRV data were collected continuously on participants before catheterization using a new ECG patch (VivaLNK). We assessed HRV by *Dyx* (primary) and high and low frequency power, multiscale entropy, and deceleration capacity. Two-sample t-tests and logistic regressions (with adjustment for age and sex) were used to study the difference in HRV (before cardiac catheterization) between those with high versus low depressive burden ( $\text{PHQ-9} \geq 10$ ), and in those with versus without obstructive CAD ( $>70\%$  stenosis). **RESULTS/ANTICIPATED RESULTS:** We assessed 30 individuals with mean (SD) age 62.4 (13.2); 7.1% were female and 15.4% were black. Mean *Dyx* in high depressive symptoms ( $N = 21$ , 70%) was 1.8 (0.2) and in none-low depressive symptoms ( $N = 7$ , 23%) was 2.2 (0.2). Differences were also observed for high frequency (HF) (4.4 (1.1) vs. 6.0 (1.4)) and deceleration capacity ( $-4.2$  (2.1) vs.  $-10.7$  (8.5)). Mean *Dyx* in obstructive CAD ( $N = 17$ , 57%) and non-obstructive CAD ( $N = 10$ , 33%) was 1.7 (0.6) and 2.6 (1.2) respectively. Differences were seen with sample entropy (1.2 (0.2) vs. 1.5 (0.2)). Every 1 unit of  $\log(\text{HF})$  had an odds ratio = 0.14 (95% CI 0.06 – 0.36) for depression. **DISCUSSION/SIGNIFICANCE OF IMPACT:** ANS dysfunction, measured by HRV, associates with both depression and obstructive CAD.

Autonomic ECG markers may play an important role in assessing brain-heart pathology, and may be useful to study the interaction between depression and CAD.

4511

### Bio-Compatible Implantable Oxygen Sensor Technology with Real-Time Monitoring of Surgical Flaps and Reimplantation

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**OBJECTIVES/GOALS:** Current surgical flap and replantation monitoring techniques have limitations in detecting the pathologic state, calibration and cost-to-patient issues. Our hypothesis is that novel implantable oxygen sensors can provide a more efficient, accurate, and reliable monitoring of tissue oxygenation. **METHODS/STUDY POPULATION:** Experimental sensors were used with an exogenous remote used as a reader once implanted (Fig. 1) A rat tissue perfusion model with three regions of an SIEA flap as well as into adjacent control sites was made (Tip, Middle, and Base) Blood flow was greatest at the base, diminishing towards the Tip, thus creating a perfusion gradient. Changes in tissue oxygen tension PO<sub>2</sub> were estimated by the steady-state fluorescence of the optical sensors using an IVIS imaging system. The sensors were used to collect data from days 0, 3, and 7 as a reading of Tissue Oxygen Tension (TOT) with ANOVA used to assess for statistical significance in blood oxygen data with respect to relative perfusion status. **RESULTS/ANTICIPATED RESULTS:** Inspired FiO<sub>2</sub> was decreased from 100% to 12% with a corresponding change in the TOT readings from all sensors. (Fig. 2) The tip portion of the flap demonstrated the most profound detection of tissue necrosis, with the middle demonstrating the second most necrosis and the base demonstrating the least with correlating TOT sensor readings. (Fig. 3) Acute vascular compromise of the feeding blood vessels in the pedicle was immediately detected within 70 seconds ( $*p < 0.05$ ). (Fig. 4) **DISCUSSION/SIGNIFICANCE OF IMPACT:** This study introduces and validates a recent technique to monitor acute vascular occlusion, flap viability, and necrosis in the immediate postoperative period in a validated rodent model. Future directions of this novel technology will aim to reproduce these findings in clinical feasibility studies.

4119

### Cholecystokinin (CCK) Receptor Antagonist Reverses Nonalcoholic Steatohepatitis (NASH) by Reducing Hepatic Macrophages and Inflammatory Cytokines<sup>†</sup>

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**OBJECTIVES/GOALS:** NASH increases the risk of cirrhosis and liver cancer. High-fat diets increase CCK levels and CCK receptors have been identified on fibroblasts and immune cells. We hypothesized that CCK receptor blockade could prevent NASH by altering the hepatic microenvironment and macrophage activation. **METHODS/STUDY POPULATION:** Female mice were fed a Choline Deficient Ethionine supplemented (CDE) saturated fat diet or control high-fat diet for 18 weeks. Mice in each group were treated with a CCK receptor antagonist, proglumide (0.1 mg/ml) in the