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TL1 Team Approach to Investigating Host-Microbe Interactions in Cancer Using a 3D Perfusion Culture System

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OBJECTIVES/GOALS: We seek to develop a 3D perfusion culture imaging plate for human fecal bacteria co-culture with epithelial cells in a structure that mimics the gut epithelium. We will develop this system for use with patient fecal samples to characterize patient risk of developing cancer. METHODS/STUDY POPULATION: *E. coli* NC101, a strain that harbors the *pks* gene island, produces the genotoxin colibactin which causes DNA damage that can lead to colorectal cancer development. The genotoxic ability of this bacterium is dependent upon cell-to-cell contact. Here, we present 3D printed *E. coli* NC101 and intestinal epithelial cells (IEC-6) in a perfusion imaging plate, enabling visualization of the cytotoxic effects of the bacteria in real time using confocal microscopy, in combination with flow cytometry analysis for cell cycle arrest (a surrogate marker of DNA damage). RESULTS/ANTICIPATED RESULTS: 40,000 IEC-6 cells were 3D printed in a cylindrical layer in our triple well imaging plate. The cells were infected at an MOI of 100 for 18 hours and time lapse images of the infection were recorded by confocal microscopy. The cells were then harvested for analysis by flow cytometry for cell cycle arrest as a measure of DNA damage. Our images and flow cytometry data show that E. coli NC101 co-localizes with IEC-6 cells and causes cell cycle arrest in phase G2 (infected %G2 = 40.1), compared to uninfected cells (%G2 = 24.7, P = 0.034). Mutant strains lacking adhesion protein FimH or the ability to produce colibactin do not cause G2 cell cycle arrest (P = 0.844 and P = 0.644, respectively). DISCUSSION/SIGNIFICANCE OF IMPACT: We are able to recapitulate the DNA damage phenotype of E. coli NC101 in our 3D culture system. We show here that host-microbe interactions leading to cancer can be modeled in our 3D perfusion system, and we will next use patient fecal samples in our culture system.

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TL1 Team Approach to Predicting Short-term and Long-term Effects of Spinal Cord Stimulation

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OBJECTIVES/GOALS: Spinal cord stimulation (SCS) is an intervention for patients with chronic back pain. Technological advances have led to renewed optimism in the field, but mechanisms of action in the brain remain poorly understood. We hypothesize that SCS outcomes will be associated with changes in neural oscillations. METHODS/STUDY POPULATION: The goal of our team project is to test patients who receive SCS at 3 times points: baseline, at day 7 during the trial period, and day 180 after a permanent system has been implanted. At each time point participants will complete 10 minutes of eyes closed, resting electroencephalography (EEG). EEG will be collected with the ActiveTwo system, a 128-electrode cap, and a 256 channel AD box from BioSemi. Traditional machine learning methods such as support vector machine and more complex models including deep learning will be used to generate interpretable features within resting EEG signals. RESULTS/ANTICIPATED RESULTS: Through machine learning, we anticipate that SCS will have a significant effect on resting alpha and beta power in sensorimotor cortex. DISCUSSION/SIGNIFICANCE OF IMPACT: This collaborative project will further the application of machine learning in cognitive neuroscience and allow us to better understand how therapies for chronic pain alter resting brain activity.

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TX TM: Formalization and Institutional Investment in a Model Designed to Advance Research Translational to Community Transformation

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OBJECTIVES/GOALS: Morehouse School of Medicine (MSM), $T^{x\ TM}$ is a scientific philosophy promoting interdisciplinary approaches towards exponential advances in community and population health. Objectives are to detail the model, pilot funding mechanism, early research findings and infrastructure investments. METHODS/STUDY POPULATION: The health research system has widely acknowledged challenges that can delay research translation to systems that advance health for chronically disadvantaged health disparity population groups. MSM's vision is to lead the creation and advancement of health equity. The vision-aligned strategic plan prioritized formalization of a $T^{X\ TM}$ implementation priority. The study population was the institution's research faculty and leaders, research administration, and communication arm. Through a cross-institutional working group, a plan was deployed to 1) assess the institutional landscape, 2) review the grey and peer reviewed literature on translational research and 3) invest in a pilot research funding mechanism. RESULTS/ANTICIPATED RESULTS: Over $700K has been invested in $T^{X\ TM}$ implementation. Over half of research faculty completed an institutional landscape assessment to identify translational research expertise, interests and points of interest in new collaboration. The most frequently cited collaborative research interests were clinical research with human subjects, patient-centered outcomes and laboratory-based research with human subjects/specimens. Funded multidisciplinary and/or community-engaged pilot studies investigate the role for circadian rhythms and shift work, cultural variables influencing mental health among Haitians living in the US and integrating prescription reconciliation telehealth in primary care. DISCUSSION/SIGNIFICANCE OF IMPACT: $T^{X\ TM}$ requires interdisciplinary collaboration across translational research spheres *and* beyond the academy. Institutional investment, infrastructure support and senior-level champions are central to awareness and rewarding such scholarship towards scaling approaches that advance health equity. CONFLICT OF INTEREST DESCRIPTION: Coined at Morehouse School of Medicine (MSM), $T^{x\ TM}$ symbolizes an approach and scientific philosophy designed to intentionally promote and support convergence of interdisciplinary approaches and scientists to stimulate exponential advances for the health of diverse communities.

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