(66.7% of patients), neuropathy (48.8%), muscle pain (44.0%), insomnia (39.3%), and general pain (38.1%). Patients on LOT ≥4 had most of these symptoms more often than LOT <4 (fatigue: 70.6% of patients vs. 60.0%, neuropathy: 71.8% vs. 40.0%, muscle pain: 47.1% vs. 42.2%, insomnia: 35.3% vs. 40.0%, general pain: 47.1% vs. 33.3%). For those on LOT ≥4, 42.9% of survey responses endorsed "somewhat", "quite a bit", or "very much" symptom bother compared to 32.7% for LOT <4. QOL was similar between groups. Over many months, patients on LOT ≥4 had several persistent symptoms (neuropathy, sadness, insomnia), but even those on LOT <4 had unmet symptom needs (fatigue, general pain, constipation). DISCUSSION/SIGNIFICANCE: Evidence shows that treatment selection at higher LOT in MM often underrates the impact of cumulative symptom burden. Our study reveals significant longitudinal unmet needs regarding symptom and distress management in MM; understanding this can help guide treatment decisions and palliative care for MM patients with escalating treatment demands.

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Deciphering the role of IL-4 in post-colitis repair*

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OBJECTIVES/GOALS: Incomplete mucosal healingand dysbiosis prevent long-term remission after colitis. IL4 may restore colon homeostasis through its action on immune cells and the microbiome. We will demonstrate this mechanism using genetically modified mice and molecular tools. This may result in target therapies that prolong remission in patients with IBD. METHODS/STUDY POPULATION: Mice were treated with 3% dextran sulfate sodium (DSS) in drinking water for 5 days to induce colitis. Mice were monitored daily for changes in body weight, and to monitor colitis severity. At each endpoint, mice were sacrificed and colon length was measured. For disease severity assessment, mouse colons were prepared in paraffin sections by the 'swiss-rolling' method. For flow cytometry, lamina propria mononuclear cell isolation was performed and cellular populations were stained with fluorophore-conjugated antibodies. IL4-eGFP-expressing (4get) mice were used to analyze the cellular expression of IL4 after colitis. Cell-specific IL4 deletion mice were generated using the cre-lox system. RESULTS/ANTICIPATED RESULTS: IL4-deficient mice had worse colitis compared with wild-type controls. Flow cytometry of lamina propria cells from 4get mice showed that most IL4-producing cells after colitis are eosinophils (CD11b+SiglecF+). Flow cytometry of C57bl6 mice showed an influx of IL4Ra+ monocytes (CD11b+Ly6C+) and macrophages (CD11b+F480+). IL4-stimulated bone marrow-derived macrophages demonstrated an increase in HB-EGF mRNA transcription. Myeloid-specific IL4R deleted mice had no difference in colitis severity compared with controls. Neutrophil-specific IL4R-deleted mice had increased colitis severity and mortality. Co-housing of littermate mice rescued recovery after DSS in IL4 deficient mice. DISCUSSION/SIGNIFICANCE: IL4 appears to play a role in restoring homeostasis after colitis. The mechanism depends on eosinophil-derived IL4, and action through neutrophils. However, the reparative function of IL4 can be shared with deficient mice through the microbiome. I will study the cellular and microbial mechanism by which IL4 restores homeostasis after colitis.

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Identifying neural and behavioral correlates of social learning and empathetic responding associated with early life adversity

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OBJECTIVES/GOALS: This study seeks to elucidate the relationships between early life adversity (ELA), social learning, and empathic responding. Specifically, it aims to understand the impact of ELA on the expression of empathy and ability to adjust behavior after social observation. METHODS/STUDY POPULATION: 60 healthy participants ages 18-65 will be recruited from the greater Baltimore area. They will undergo a placebo manipulation paradigm with simultaneous EEG recording to capture neural oscillations in frontal and insular cortices and event-related potentials. Participants will observe a demonstrator who indicates pain relief in response to the application of an inert cream. Then, while undergoing heat pain stimulations, the participant will receive the same inert cream and rate their physiological and psychological pain experience using a visual analog scale. The heat stimulations will be lowered without their knowledge to measure placebo response. Participants will also answer a battery of questionnaires which assess personality, psychological factors, life history, empathy, and current social life. RESULTS/ANTICIPATED RESULTS: It is expected that ELA will result in decreased placebo response, interpreted as deficits in social learning. Further, we expect that this effect is moderated by state empathy, empathy in a specific context or moment. We predict that individuals with lower state empathy and exposure to adversity will have greater deficits in social learning. We also expect to see more robust event-related potentials preceding painful stimulations at electrodes corresponding to the medial and ventral prefrontal cortex and insula in ELA-exposed participants. Because these brain regions are connected to anticipatory and predictive circuits, this would indicate that the individual has not adjusted their expectations according to the social information gained via observation. DISCUSSION/SIGNIFICANCE: Results of this study will expand our understanding of how ELA impacts behavior throughout life. Individuals with a history of ELA often face social difficulties and a higher risk of psychiatric disorders. This study will illuminate possible neural correlates of these differences in social behavior and, more generally, the expression of empathy.

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Deformable Medial Modeling to Generate Novel Shape Features of the Placenta Using Automated versus Manual Segmentations*

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OBJECTIVES/GOALS: In this study, we implemented deformable medial modeling as a morphometric approach in first trimester placentas to characterize morphometric differences between fully

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automated and manual segmentations. METHODS/STUDY POPULATION: Twenty placentas from singleton pregnancies between 11-14 weeks' gestation were manually and automatically segmented from 3D ultrasound volumes. Automated segmentations were produced by a trained convolutional neural network pipeline. Dice overlap scores and volumes were computed between manual and automated segmentations. Deformable medial modeling was applied to both manual and automated segmentations to produce the following metrics: maternal and chorionic surface areas (SA), thickness, circumference, and diameter along the generated medial surface. Placental non-planarity was also determined as the greatest medial surface height difference. A paired t-test and simple linear regression was performed between manual and automated segmentations for each shape metric. RESULTS/ANTICIPATED RESULTS: Mean placental volume measurements between manual and automated segmentations were similar, with a percent difference of 3.28% and a mean Dice overlap score of 0.85 ± 0.07. There were strong, statistically significant ($p < 0.01$) linear correlations with chorionic and maternal SA, SA difference, thickness, circumference, medial surface diameter, and medial surface height difference. No significant differences were noted with chorionic SA, thickness, circumference, maximum medial surface diameter, or medial surface height difference. However, statistically significant differences ($p < 0.01$-0.03) were noted in maternal SA, SA difference, and mean medial surface diameter. Despite these differences, mean percent difference for all morphometric parameters was less than or equal to 10%. DISCUSSION/SIGNIFICANCE: A deformable medial model evaluate unique global and regional shape placental features with highly correlated values between manual versus automated placental segmentations. However, clinical studies are needed to determine if minor differences would impact the clinical utility of these features as potential indicators of placental function.

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Does incorporation of plasma biomarkers to the Lung Injury Prediction Score improve the predictive value for development of acute respiratory distress syndrome?*

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OBJECTIVES/GOALS: To determine if incorporating specific laboratory values and plasma biomarkers (club cell secretory protein (CC16), matrix metalloproteinase 3 (MMP3), interleukin 8 (IL-8), protein C) to the Lung Injury Prediction (LIP) Score improves the predictive value for development of acute respiratory distress syndrome (ARDS) in ICU patients. METHODS/STUDY POPULATION: Adult patients admitted to the ICU on supplemental oxygen over baseline requirement with a LIP Score ≥6 will be included. Patients admitted to the ICU >24 hours, end-stage renal disease, decompensated heart failure, or <100 µL plasma available will be excluded. Whole blood will be collected from the core lab, centrifuged, and plasma will be stored at -80°C. Protein biomarkers will be measured using enzyme-linked immunosorbent assay. Baseline characteristics, laboratory values, ventilator parameters, and clinical outcomes will be collected from the medical record. ARDS will be defined by the Berlin criteria. Machine learning methods will be used to identify the model with the highest predictive accuracy. Area under the receiver operating characteristic curve of each model will be compared to the LIP Score. RESULTS/ANTICIPATED RESULTS: Research is in progress. Plasma samples and clinical data have been collected for 148 of the 160 samples required to achieve power. Biomarker analysis will take place after sample collection is complete. We anticipate a machine learning model incorporating laboratory values and one or more plasma biomarkers into the LIP Score will outperform the baseline LIP Score for prediction of ARDS development. DISCUSSION/SIGNIFICANCE: Delayed diagnosis and intervention contribute to poor ARDS outcomes. Current predictive models for ARDS have low accuracy and enriching these models with plasma biomarkers may increase their predictive value. Development of accurate models may facilitate earlier ARDS diagnosis and intervention as well as enrichment strategies for ARDS trials.

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Developing Methods for High-Resolution Characterization of Plasma Cells*

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OBJECTIVES/GOALS: Antibodies play an important role in the pathogenesis of a wide range of diseases, including cancer, autoimmune diseases, and infections. There are currently no reliable methods to isolate and study specific plasma cell subpopulations as antibody production sources. We aim to develop methods to study plasma cells in high resolution. METHODS/STUDY POPULATION: We will use molecular cloning to engineer fusion proteins that would bind plasma cell proteins to study these cells based on their surface features. The first phase of our study consists of assessing the efficacy of this plasma cell isolation method in established cell lines (e.g., RPMI 8226) and also antibody-secreting cell lines that we are establishing as a part of this study. In the second phase of the study, we will assess the efficacy of this method by studying antigen-specific plasma cell populations in the bone marrow aspiration samples of 20 healthy volunteers using various assays, including ELISPOT, flow cytometry, and fluorescent microscopy. RESULTS/ANTICIPATED RESULTS: We have designed the constructs and have completed the cloning. The final plasmids have been verified using various restriction enzymes and Sanger sequencing. Following the transfection of Freestyle HEK 293F cells and isolation of respective proteins, we expect to be able to utilize these engineered proteins to differentiate various antibody-secreting plasma cells. We will use cell lines for proof-of-concept experiments and will subsequently move this method to human bone marrow samples. We expect to be able to visualize multiple specific antibody-secreting plasma cell populations using fluorescent microscopy and utilize this method to isolate them by cell sorting via flow cytometry. DISCUSSION/SIGNIFICANCE: We expect to be able to use this method to target specific plasma cell clones in the advancement of precision medicine regarding the treatment of plasma cell disorders (e.g., multiple myeloma) and also expand its use in other areas, such as antibody discovery and the assessment of the humoral immune responses in infectious diseases.

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