or mixed cell populations. By studying the effect of IFNβ/α activity ratio on individual monocytes, we can determine the functional impact of the IFN ratio and suggest the cellular mechanisms that underlie response/non-response to TNFi therapy in RA. METHODS/STUDY POPULATION: We used single cell analysis to investigate whether monocyte gene expression differs significantly between RA patients according to their pre-TNFi serum IFN-β/α ratio. Single classical (CL) and non-classical (NC) blood-derived monocytes were isolated from 15 seropositive RA subjects prior to biologic therapy. Subjects were grouped by pre-TNFi serum IFN-β/α ratio into two groups, those with a high IFN-β/α ratio (≥1.3, n = 6) and those with a low IFN-β/α ratio (<1.3, n = 9). 87 target genes were analyzed. Genes that varied significantly between the groups by categorical analyses were tested in multivariate logistic regression models. RESULTS/ANTICIPATED RESULTS: Every participant was seropositive for rheumatoid factor and antibodies to cyclic citrullinated peptide. Among the participants in the groups, there were no significant differences in age or DAS scores (P>0.05). The treatments were comparable and none were being treated with biologic therapy. There were striking differences in monocyte gene expression between patients with pre-treatment blood IFNβ/α activity <1.3 and ≥1.3. Expression of (1) key type I IFN pathway genes (JAK1, STAT2, IFIT2, IFIH1, PRDM1); (2) IL12; (3) CD36; and (4) CTLA4 were the strongest differentiators between groups (p<0.0001 for each, corrected for multiple comparisons). DISCUSSION/SIGNIFICANCE OF IMPACT: In this study we were able to measure gene expression in single monocytes from seropositive RA patients prior to biologic treatment. Within-cell co-expression patterns demonstrate biological differences in monocytes of RA patients with an IFNβ/α ≥1.3, the ratio of type I IFNs which predicts non-response to TNFi. The data suggest that there may be differential IFN production and pathway activation in patients who do not respond to TNFi. The increased expression of CD36 in monocytes from RA patients with high IFN β/α activity may be a reflection of increased "foam cells" in the inflamed tissue of patients who do not respond to TNFi. Enrichment of CTLA4 in those with high serum IFNβ/α suggests that CTLA4-Ig may be less likely to be an effective alternative for someone who is not likely to respond to TNFi. Current work includes determining whether the peripheral blood findings reflect altered cellular composition, type I IFN production and signaling in the synovium. Significance: This work will help to develop a more individualized approach to therapy in RA and determine an immunological basis of response/non-response to TNFi.

3299

Dynamic Afterload Cardiac Microtissue Model To Examine Molecular Pathways of Heart Failure

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OBJECTIVES/SPECIFIC AIMS: This project aims to determine the key molecular pathways that link increased myocardial wall stress to cardiomyocyte hypertrophy and subsequent heart failure. We will use a cardiac microtissue (CMT) model with dynamically tunable cantilever stiffness to examine changes in CMT hypertrophy and electro-mechanical properties in response to increased afterload (cantilever stiffness). Subsequently, we will determine if inhibition of pro-hypertrophic or anti-hypertrophic pathways alter the hypertrophic response to increased afterload. Primary outcomes for this

study are static/dynamic force, minimum electric field strength (VT), maximum capture rate (MCR), average cell area, and tissue cross-sectional thickness, and secondary outcomes are degree of myoblast activation and apoptosis. METHODS/STUDY POPULATION: CMT platforms will be fabricated using iron-doped polydimethylsiloxane (PDMS) to create magnetically tunable cantilevers. Cantilever stiffness will be increased with the application of an external magnetic field. Cantilever stiffness will be measured using a capacitance probe, where the force required to deflect both the cantilever and calibration probe is in accordance with Hooke's Law. Human induced pluripotent stem cell cardiomyocyte (hiPSC-CMs) will be cultured and matured as 3D CMTs. In-vitro static/dynamic force generation will also be calculated by measuring the deflection of the cantilevers and applying Hooke's law. CMTs will be paced using carbon electrodes to obtain VT and MCR. Structural data will be obtained using immunostaining and confocal microscopy. Finally, we will use pharmacologic inhibitors to inhibit molecular pathways that we identified in prior genetic screens such as ABCC8 (anti-hypertrophic mediator) and C1QTNF9 (pro-hypertrophic mediator). We will examine each of these pathways in low- and high-stiffness conditions. RESULTS/ANTICIPATED RESULTS: We believe increased afterload will cause significant hypertrophy, measured by increases in CMT cross-sectional thickness, cardiac myocyte area, myofibroblast activation, and myocyte apoptosis. In addition, we expect to see increases in static/dynamic force, increased voltage threshold, and decreased maximum capture rate. Preliminary results show a 64.3% increase in force generation when stiffness is increased by approximately 30%, and a 44.4% decrease in force generation when stiffness is decreased by approximately 30%. Finally, we expect that inhibiting a pro- or anti-hypertrophic molecular pathway will weaken or strengthen the hypertrophic response to increased afterload, respectively. DISCUSSION/SIGNIFICANCE OF IMPACT: To our knowledge, our lab is the first to create a dynamically tunable afterload system in the cantilever CMT model. This advance provides us with a robust platform to determine the molecular pathways that cause increased myocardial wall stress to result in cardiomyocyte hypertrophy and heart failure, which remain a critical knowledge gap in our understanding of cardiovascular disease. With more precise understanding of these pathways, we will equip ourselves with the knowledge to develop novel therapeutic agents to prevent the development or progression of heart failure.

3004

Effects of Early Life Stress on Adult Behavioral and Neural Outcomes in Rats

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OBJECTIVES/SPECIFIC AIMS: Early life stress is known to greatly impact neurodevelopment during critical periods, conferring risk for various psychopathologies, including the onset and exacerbation of schizophrenia and anxiety disorders. The endocannabinoid system is highly integrated into the stress response and may be one means by which early life stress produces such deleterious effects. Using a naturalistic, ecologically valid animal model, this study explored interactions between the stress response and endocannabinoid systems within the cerebellum, a region dense with the CB1 endocannabinoid