Informatics and Data Science

298

Improving AI Assessment of Cutaneous Chronic Graft-Versus-Host Disease using Unlabeled Patient Photographs†

Andrew McNeil[1], Kesley Parks[2], Edward Cowen[3], Julia Lehman[4], Dominique Pichard[5], Michi Shinohara[6], Mary Flowers[7], Benoit Dawant[1] and Eric Tkaczyk[2]
[1]Vanderbilt University; [2]Vanderbilt University Medical Center; [3]National Institute of Arthritis and Musculoskeletal and Skin Diseases; [4]Mayo Clinic; [5]National Center for Advancing Translational Sciences (NCATS); [6]University of Washington and [7]Fred Hutchinson Cancer Center

OBJECTIVES/GOALS: Measuring the area of skin involvement in chronic graft-versus-host disease (cGVHD) relies on costly, time-consuming manual assessment, with high disagreement among experts (>20%). Our published AI method, trained on labeled 3D photos, showed promise for delineating affected areas. We aim to improve its performance using unlabeled 2D photos. METHODS/STUDY POPULATION: Our published AI model (baseline) was trained on 360 labeled photos of 36 cGVHD patients,from a 3D camera with calibrated distance and lighting.Our gold standard labels were contours around affected skin, marked by a trained expert. A second unlabeledcohort of 974 standard 2D photos of 8 cGVHD patients was used to improve the baseline model. First the baseline model predicted affected areas on the unlabeled photos. Photos with good predictions were added to the training set with their AI-predicted labels. The model was then re-trained with the expanded labeled set. Models were successively trained with more AI labels until performance stopped improving. AI performance was assessed on a test set of 20 photos from 20 patients unseen during training, labeled by 4 experts to improve accuracy. RESULTS/ANTICIPATED RESULTS: Model performance was calculated by comparing against the gold standard labels on the test set. To quantify the spatial overlap of labeled areas the Dice coefficient was used (0 is no overlap, 1 is complete agreement), where higher values are better. To estimate clinical error we used surface area error (Error), where lower values are better. On the test set, the baseline model had a median Dice of 0.57 [interquartile range: 0.39 – 0.82] and Error of 57.6% [20.2 – 103.3%]. Re-training with additional AI-predicted labels from 8 new patients, the model yielded a median Dice of 0.60 [0.35 – 0.80] and Error of 50% [12.5 – 103.8%]. This approach is being expanded to a further 300 unlabeled patients, where we anticipate significant improvements to AI performance and consistency. DISCUSSION/SIGNIFICANCE: Evaluating AI models in standard photos could provide a consistent method of assessing and tracking cutaneous cGVHD and relieve the burden of costly expert assessment. A reliable automated AI tool would provide a meaningful improvement to the current standard of manual assessment and could be easily applied to large patient cohorts.

299

A CTS team approach to assess the in vitro toxicity of microplastic fibers to human lung epithelial cells cultured at an air-liquid interface†

Amber O'Connor[1], Sripriya Nannu Shankar[2,3], Anna Lewis[4], Lee Ferguson[4], Chang-Yu Wu[2,5] and Tara-Sabo Attwood[1]
[1]Department of Environmental & Global Health, University of Florida, Gainesville, FL, USA; [2]Department of Environmental Engineering Sciences, University of Florida, Gainesville, FL, USA; [3]Department of Environmental and Public Health Sciences, University of Cincinnati, OH, USA; [4]Department of Civil and Environmental Engineering, Duke University, Durham, USA and [5]Department of Chemical, Environmental and Materials Engineering, University of Miami, FL, USA

OBJECTIVES/GOALS: Our goal is to determine whether microplastic fibers (MPFs) provide signals for dendritic cell-induced Th2 polarization via epithelial-cell-derived thymic stromal lymphopoietin (TSLP). We seek to highlight a potential mechanism for MPF-induced airway toxicity associated with asthma exacerbation. METHODS/STUDY POPULATION: Primary human bronchial epithelial cells (NHBEs) were grown and differentiated at an air-liquid interface. Dyed and undyed polyester MPFs (14x45 μm) generated using a cryomicrotome were delivered to NHBEs through a custom designed mesh-hopper system. After the exposure period (6, 12, 24 hrs), cell viability was assessed using alamarBlue, and RT-qPCR was performed to determine mRNA expression of asthma associated genes (i.e., TSLP, IL-13, IL-33, etc.,) in NHBEs. Bulk mRNA-sequencing followed by bioinformatics will be performed to observe other plausible pathways tweaked by lung cell exposure to MPFs. RESULTS/ANTICIPATED RESULTS: Through gravimetric analysis, it was determined that the mesh-hopper system can achieve delivery efficiencies of at least 85% for as low as 500 fibers. Following exposure, results show polyester MPFs (500 - 1,000 fibers) exposed to NHBEs at multiple time points (6, 12, 24 hrs) did not result in a statistically significant decrease in cell viability. Treatment with 500 undyed MPFs resulted in a slight increase in TSLP expression at 6 hrs that decreased over time, whereas all other treatment groups resulted in TSLP downregulation. Similarly, 500 undyed MPFs resulted in an increase in IL-13 expression at both 6 and 12 hrs with all other treatment groups leading to IL-13 downregulation. We anticipate the RNA-seq results will show pro-inflammatory pathways are highly targeted following NHBE exposure to MPFs. DISCUSSION/SIGNIFICANCE: This study is one of the first to mechanistically assess the impact of MPFs on lung cells while simultaneously addressing the need for a reliable system that delivers MPFs to ALI cultures to better mimic inhalation and avoid inadequate resuspension of particles in liquid medium.

300

Psilocybin-induced changes in neural reactivity to alcohol and emotional cues in patients with alcohol use disorder: An fMRI pilot study†

B.A. Pagni[1], P.D. Petridis[1], S.K. Podrebarac[1], J. Grinband[2], E.D. Claus[3] and M.P. Bogenschutz[1]
[1]Department of Psychiatry, NYU Langone Center for Psychedelic Medicine, NYU Grossman School of Medicine, New York, NY, USA; [2]Departments of Psychiatry and Radiology, Columbia University Vagelos College of Physicians & Surgeons, New York, NY, USA and [3]Department of Biobehavioral Health, The Pennsylvania State University, University Park, PA, USA

OBJECTIVES/GOALS: This pilot study investigated psilocybin-induced changes in neural reactivity to alcohol and emotional cues in patients with alcohol use disorder (AUD). METHODS/STUDY POPULATION: Participants were recruited from a phase II, randomized, double-blind, placebo-controlled clinical trial investigating psilocybin-assisted therapy (PAT) for the treatment of AUD (NCT02061293). Eleven adult patients completed task-based blood oxygen dependent functional magnetic resonance imaging (fMRI)

https://doi.org/10.1017/cts.2024.273