utilized to image protein activity noninvasively in animals and humans. We hypothesized that specific inflammatory processes observed in nephritis can be noninvasively detected and monitored using NIRS-based optical imaging approaches. Using a probe that becomes fluorescent in the presence of the protease cathepsin B (CatB), we tested the ability of using NIRS optical imaging to assess renal inflammation as a noninvasive marker for early-stage glomerulonephritis (GN).

Methods Experimental GN was induced in 129 mice by nephrotoxic serum (NTS) delivered intravenously. Proteinuria was quantified using albumin ELISA and chromogenic creatinine assay. NIRS optical imaging of anesthetized mice was performed following intravenous administration of a cleavable sensor for CatB and fluorescence intensity of kidney regions quantified using fluorescence molecular tomography (FMT)–3000 instrument at days 1 to 10 post-NTS administration.

Results In NTS-treated mice, a strong signal from the CatB-activatable probe was observed as early as day 1, which associated with the onset of proteinuria (figure 1). This signal could be detected for at least 10 days. In contrast, control mice were devoid of any CatB signal. To assess the specificity of CatB signal to GN, we examined CD2AP KO mice that develop nephrotic syndrome in the absence of inflammation. CD2AP KO had no CatB signal despite ongoing nephrosis.

Conclusions Induction of GN by NTS was specifically detected noninvasively using a CatB-activatable probe and NIRS optical imaging. These data establish the proof-of-principle that novel noninvasive tomographic approaches may represent a translatable approach to establishing early stages of GN. We believe that this approach can be expanded to other experimental imaging approaches, such as photoacoustics, as a novel method for detecting lupus nephritis in humans.

Funding Source(s): Department of Defense Discovery Award #W81XWH–17–1–0128 (PI: Kim)

Representative images of a control mouse and a mouse treated with nephrotoxic serum to induce glomerulonephritis (NTS). A strong fluorescence signal induced by cathepsin B is observed in NTS-treated mice only.

ACTIVATED STRESS RESPONSE GENES AND PERTURBATION OF REGULATORY PATHWAYS IN ANTINUCLEAR ANTIBODY POSITIVE INDIVIDUALS AND SLE PATIENTS VARY BY CELL TYPE AND RACE IN SINGLE-CELL TRANSCRIPTOMIC ANALYSES

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ENvironmenTal and ATMOSPHERic FActORS in SYSTEMic LUPUS eryThematOsis: A regressiOn ANALYSIS

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Background Understanding the role of environmental exposures in the development of SLE and their association with SLE activity may help identify modifiable risk factors and potential etiological mechanisms. We hypothesized that changes in fine particulate matter (PM2.5) concentration, ozone concentration, temperature, resultant wind, relative humidity, and barometric pressure are predictive of organ specific flares in lupus.

Methods 1628 patients who fulfill 4 of the 11 ACR or SLICC classification criteria for SLE were included in the analysis. The data ranged from 1999 to 2017. Maximum distance between visits was 110 days with 1 month time aggregation units. Disease activity was expressed as Physician Global Estimate (PGA), taken at every patient visit. A flare was defined as a PGA score increase of 1 point or more compared to the previous visit.