Systemic lupus erythematosus (SLE) is an autoimmune disease that damages many organs and tissues. SLE is characterized by the production of autoantibodies and the presence of circulating immune complexes (ICs) in blood. Neuropsychiatric lupus erythematosus (NPSLE) refers to the neurological and psychiatric symptoms directly related to SLE. Alterations in the blood-brain barrier (BBB) and presence of IgG antibodies have been observed in the brain of individuals affected by NPSLE. ICs bind Fcγ receptors (FcγRs), which signaling can play a major role in inflammation and thrombotic events. FcγRIIA receptor is expressed by many immune cells, such as platelets and neutrophils in humans, but it is absent in mice. This explains in part why the interactions of platelets and neutrophils with the brain vasculature endothelium in response to ICs have never been investigated. In this study, we used nanoscale-resolution chip mapping scanning electron microscopy to study the brain vasculature of lupus-prone mice expressing the FcγRIIA transgene (NZB/NZW F1.FcγRIIA<sup>TGN</sup>). We found neutrophils (figure 1A), platelets (figure 1B-C) and immune complexes (figure 1C) adhered to the endothelium of the brain vasculature. To visualize and quantify at the cellular level the events taking place in the brain vasculature in response to systemic administration of surrogate ICs, we generated Ly6gCre<sup>+/−</sup>::Rosa26-TdT<sup>+/−</sup>::CD41-YFP<sup>+/−</sup> mice expressing the FcγRIIA transgene and fluorescence in neutrophils (red) and platelets (yellow). Using
real-time videomicroscopy to capture high velocity events and an unbiased computer assisted analysis approach, we provide images and quantifications of the cellular responses downstream of FcyRIIA stimulation. We observed platelet aggregation and neutrophil adhesion to blood vessel walls in response to ICs, only in FcyRIIA^TGN mice. Moreover, stable and transient interactions between platelets and neutrophils were captured in real time. Taken together, the results highlight the importance of the FcyRIIA receptor in neutrophil adhesion to the BBB in response to ICs and suggest the potential implication of neutrophils and platelets in mediating alterations of the BBB in NPSLE. This study puts forward an imaging and quantifying approach in a quadruple transgenic mouse model that can be utilized for the study of the pathogenic roles of ICs disease.

### Abstracts

#### 405 STRUCTURAL NEURAL UNDERPINNINGS OF LOW MOOD AND ANXIETY IN CHILDHOOD ONSET SYSTEMIC LUPUS ERYTHEMATOSUS

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**Objectives** Emotional dysfunction in childhood-onset systemic lupus erythematosus (cSLE) impacts clinical outcomes and quality of life, but the relationship to lupus brain inflammation is poorly understood. We aimed to investigate the structural neural metrics and disease activity measures that predict anxiety and depression in cSLE and non-cSLE children.

**Methods** A cross-sectional sample of patients with cSLE (meet-10^10^ing ACR and/or SLICC classification criteria for SLE) and healthy controls, aged 10-17 years completed self-reported measures of depression (Beck Depression Inventory-II; Children’s Depression Inventory-2) and anxiety (Screen for Child Anxiety Related Disorders). Elevated depression/anxiety symptoms were determined by established clinical cut-offs. T1-weighted sequences were acquired on a 3T Siemens MRI. MRI scans were spatially normalized using the MNI-152 template, and grey and white matter were segmented to estimate brain volume, surface area and cortical thickness in Freesurfer. Measures of disease duration, activity (SLE Disease Activity Index (SLEDAI) 2000), glucocorticoid use and inflammation were collected. Partial least squares (PLS) analyses were used to investigate the association between structural brain metrics and disease measures with depression/anxiety symptom severity.

**Results** Twenty-seven patients with cSLE (mean age=15.4 years (SD 1.7) and median SLEDAI=2.0 (IQR 2-4)) and 14 healthy controls were recruited. There were no group differences in age, sex or ethnicity. Median cumulative glucocorticoid use in this sample was 3.2 grams prednisone-equivalent (IQR 0.7-11.2). One cSLE patient had a history of neuropsychiatric lupus. We did not find group differences in prevalence of clinically elevated depression (cSLE= 12/27, controls=6/14) or anxiety (cSLE= 11/27, controls=7/14). Within group analysis of brain MRI showed that for both cSLE patients and controls, worse mood and anxiety were both predicted by reduced right anterior cingulate thickness. Within the cSLE group, worse mood and anxiety was predicted by higher cumulative steroid use, reduced right fusiform gyrus cortical thickness, and increased left amygdala and right parahippocampal volumes and thickness.

**Conclusion** This cross-sectional sample of cSLE patients had mild disease activity at the time of the study, and a high but similar prevalence of emotion problems compared to controls. Worse emotional functioning was associated with altered structural changes in regions known to underlie emotion processing in both groups. Emotion difficulties in the cSLE group were related to cumulative glucocorticoid use, but not disease activity or inflammatory markers. Further research is needed to examine the role of glucocorticoid exposure in the setting of psychological stress related to having a chronic illness during the adolescent neurodevelopmental period.

**Lay Summary** Children with lupus often experience problems with mood, such as depression and anxiety. These problems may be due to the effects of lupus on the brain, but the cause is currently unclear. We measured symptoms of depression and anxiety in 30 children with lupus. We also used advanced brain imaging to study changes in brain structure. We compared these measures between children with lupus and a group of 14 healthy peers. We also looked at how mood problems are related to brain imaging changes and lupus disease markers. Compared to their peers, we found that children with lupus had similar rates of depression and anxiety symptoms. We found that these symptoms were related to changes in brain structure in both children and their peers. In children with lupus, the symptoms were related to changes in particular brain areas. Depression and anxiety were also related to higher steroid use. These findings indicate that depression and anxiety symptoms are common in children with lupus and their peers. The results also suggest that these mood problems correlate with changes in the brain, and with steroid treatment for lupus. More research is needed to understand how steroid treatment impacts brain and mental health in children with lupus. This will lead to better mental health and overall care for these children.

#### 501 ROLE OF PLATELET-BOUND COMPLEMENT ACTIVATION PRODUCT (PC4d) IN PREDICTING RISK OF FUTURE THROMBOTIC EVENTS IN SYSTEMIC LUPUS ERYTHEMATOSUS

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**Background** Platelet-bound complement activation products (PC4d) are associated with a history of thrombosis in systemic lupus erythematosus (SLE) (Graftstein al., 2021; Petri et al., 2017). The current study evaluated the role of PC4d in assessing the risk of future thrombosis.

**Methods** PC4d (expressed at net mean fluorescence intensity [MFI]) was measured by flow cytometry from patients enrolled in the Lupus Cohorts at Columbia Univ (COL), Johns Hopkins Univ (JH) and Beth Israel Deaconess Medical Center (BI) between Apr-Sep 2017 (JH), Aug 2018-Jan 2020...