Focused -omics evaluation of peripheral clinical samples identifies novel immunophenotype patterns in inflammatory bowel disease patients

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ABSTRACT

Background: Crohn's disease (CD) and ulcerative colitis (UC) are related disorders characterized by gastrointestinal inflammation which are increasing in prevalence. The current diagnostic process for these diseases is challenging, requiring invasive procedures such as endoscopy and mucosal biopsies. Mediators of this inflammation may be detected using minimally invasive means such as using blood and urine to measure serum cytokine levels, and peripheral blood immune cell populations, and metabolite levels. However, thus far, there is no direct link between these peripheral mediators and the mucosal inflammatory response.

Objective: To demonstrate patterns of peripheral biomarkers that reflect mucosal disease mechanisms.

Methods: Both IBD and healthy control patients were enrolled, and clinical characteristics and peripheral blood and urine were collected annually for up to five years. Multiplex bead-based immunoassay (FirePlex, Abcam) was used to identify 17 cytokine profiles. Mass cytometry was used to differentiate populations of immune cells. Nuclear Magnetic Resonance (NMR) was used to identify metabolites previously known to be altered in urine from IBD patients.

Results: By combining multiple parameters from these -omics techniques, preliminary data (n = X IBD patients and n = Y controls) using machine learning suggests that these algorithms can detect patterns of immunometabolism unique to subgroups of patients independent of clinical characteristics.

Significance: These findings suggest that there are patterns that can be found in clinical samples, obtained by non-invasive means, from IBD patients that reflect unique molecular biologic signatures (immunophenotypes) of disease. The ability to understand individual patient disease mechanisms using these patterns would lead to faster diagnosis, improving patient quality of life by offering earlier treatment.

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