Examination of Human Colon Organoids for Phenotypic Anomalies in Patients with Ulcerative Colitis

Saraf, Ameya (School: William Mason High School)

Ulcerative Colitis (UC) is a disease hallmarked by continuous inflammation along the gastrointestinal tract, which is largely the consequence of autoimmunity. Its prevalence continues to spread across the globe, but much of its etiology is still unknown. Current approaches to understanding the disease mechanisms of UC are limited by inaccurate models based on 2D immortalized oncogenic cell lines. To gain new insights, this study utilized colon organoids (colonoids) derived from adult stem cells (ADSCs) to analyze phenotypic variances between UC-derived colonoids and otherwise healthy colonoids. Colonoids were formed using isolated surgical samples suspended in Matrigel and were allowed to differentiate for three days. Morphology and cell differentiation were observed using area measurements and bud count respectively using digital image processing techniques. A total of ~3000 colonoid structures were measured and statistically analyzed. Conclusively, colonoids with UC had a slower growth and differentiation rate overall, suggesting intracellular abnormalities in vivo. This refined understanding of UC may result in breakthroughs in epithelial-directed treatments that enhance mucosal healing. Importantly, not only did this novel method allow for a better understanding of UC pathophysiology, but it also provided a reference for future studies involving colonoids, as current data is limited.

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