Metabolomics analysis of iPSCs derived organoids

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Regenerative medicine is focused on functional restoration of a particular tissue and organs. Stem cell based miniaturized heterogenous cellular clusters named organoids, exhibit features of organ functionality, self-organization, multicellularity, and utility. Induced pluripotent stem cells (iPSCs), have great potential to develop organoids of specific tissues and utilized in regenerative medicine. Organoid technologies have revolutionized the approach to human development and diseases, providing outstanding tools for research and in vitro disease modeling.

The goal of this study is to investigate potential metabolites of lacrimal gland organoids from human iPSC-derived multi zonal ocular cells. With the use of metabolomics technologies, we aimed to identify the metabolites present in iPSC derived lacrimal gland (LG) organoids to better understand developmental phases in vitro. Additionally, we investigate the secretion profiles of functional LG organoids upon chemical stimulation. To achieve that we collected cell and supernatant samples of undifferentiated iPSCs, immature and mature LG organoids and analyzed with GC-MS. We identify total 128 and 179 metabolites from cell lysates and from culture supernatant respectively. The data clearly demonstrate the metabolic shifts during the differentiation, maturation and stimulation. Profiling of energy, lipid and amino acid metabolisms of organoids within defined conditions and time course has been successfully elucidated. This work can serve as a model for future organoid research.