Title: Field Asymmetric Ion Mobility Spectrometry Measurements of Human Induced Pluripotent Stem Cells for celiac HLA-haplotype detection

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Abstract
Celiac disease (CD) is an immune-mediated enteropathy. The current consensus is that CD can be developed only in individuals who carry the CD predisposing genes, the human leukocyte antigen (HLA)-DQ2 and/or HLA-DQ8. Approximately 40% of the European and North American population carry the predisposing haplotype. It is shown that specific HLA alleles are related to the production of certain volatile organic compounds (VOC) that cells secrete.

Our aim was to study whether VOC analysis, such as high field asymmetric ion mobility spectrometry (FAIMS), could give an alternative to the classic diagnosis methods to exclude the non-carriers from the predisposing haplotype carriers, as different HLA haplotype can affect the VOC composition. The HLA haplotype of CD patients has never before been characterized with FAIMS.

In this study, we utilized human induced pluripotent stem cells (hiPSC) derived from healthy control and CD patients by culturing them on a Petri dish for approximately a week and then analyzed them with FAIMS, repeated 1-3 times. In addition, the plain culture medium was analyzed in a similar way. The medium VOC profile was erased from the cell culture VOC profile for the data analysis. The VOC profiles were compared to each other with Cosine similarity in R.

In the study we noticed that high variation in VOC profile of the matrix, which potentially overshadows differences between the cells.

As a conclusion, no clear similarities or differences were found in the analysis, and the VOC profile sampling and analysis methods should be improved for future studies.