Human Plasma Lipidome Variations in Active Tuberculosis

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Introduction

Tuberculosis (TB) is one of the oldest infectious diseases caused by the Gram-positive bacterium Mycobacterium tuberculosis (MTB). Eradication of TB remains challenging with lengthy treatment durations. As human pathogens continue to infect and acquire resistance to current anti-tuberculosis drugs, recent research has turned to potential host-directed therapies in search for novel treatment strategies (1). Pathogens such as MTB may use host lipids as building blocks and influence the host cell physiology to enable their survival and replication (2). Hence, detection of changes in host lipidome during TB progression may enable novel and precise diagnostic tools as well as potentially providing insights into host-pathogen interactions.

PROJECT AIM: To identify changes in the plasma lipidome of TB patients in comparison with that of healthy controls and latent individuals. Confirm the changes in longitudinal study with plasma samples from active TB patients on established TB drug treatment over six months.

Experimental

238 human plasma samples were obtained from three different groups of volunteers: active TB patients (170), latent TB patients (45) and healthy controls (25). The efficacy and gender ratios are represented in the pie charts. The age of the volunteers spanned from 14 to 87 years old.

Experimental

After lipid extraction optimization, analyses were performed using tandem mass spectrometry. Metabolite quantitation was using a target approach with the Agilent 6510a LC-MS/MS and Agilent 1290 Infinity II (LC) liquid chromatography for the major classes of lipids. Potential biomarkers were identified using a supervised learning: multivariate discriminant analysis (LDA) and principal component analysis (PCA) followed by statistical analysis using the software package R.

Results and Discussion

Figure 2: Longitudinal study where samples from TB active patients who were on established TB drug treatment over six months were analysed

Figure 3: The research workflow

Figure 4: Heatmap of lipids showing significant differences between the sample groups

Figure 5: Index of individuality plot of lipid species measured in the longitudinal study

Figure 6: Box plots of the lipid species that showed significant differences across time points in the longitudinal study

Results and Discussion

Using mixed linear model, 11 lipids showed significant differences across the time points (p < 0.05). In general, there is an increase in the levels of the lipids across the time points after TB drug treatment. These lipids do not show significant differences due to gender, age and ethinic conditions.

References


Conclusions

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