Exploration of Immune Cell Type Composition and How It Relates to Biological Age

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Abstract

Biological age is a better indicator of health and life expectancy then chronological age. However, determination of biological age is complicated, as many factors such as environment and lifestyle affect it in different ways. The aim of this study was to explore the correlation between immune cell type composition and age, using scRNA-seq data. Seven datasets with diverse diseases and tissue types, was collected. Findings highlighted the crucial step of normalization for downstream analysis. Notable, despite multiple attempts of advanced normalization techniques, a batch effect persisted in the data, making it necessary to conduct the downstream analysis on each dataset rather than the collection of the data. An age-related decline in naive cytotoxic T cells, was found to be the most significant cell type in multiple datasets. Other cell types, such as NK cells and Plasma cells were also found to be correlated with age. However, the individual datasets showed different results. Plasma cells had the most significant correlation and change in a dataset containing COVID-positive patients, indicating that COVID-19 may disrupt age-related patterns. This study found sex-specific differences in immune cell composition, highlighting the necessity of taking sex into account when investigating immune cell type composition in relation to age. Finally, machine learning models using cell types and ratios between cell types were compared. Findings indicates that interactions between cell types should be considered as the Random Forest model performed better than the Lasso model.

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