Retrovirology

Poster presentation

P10-14. Dynamic profiling and correlation analysis of plasma viral load and cytokine and chemokine profiles in acute HIV-1 infection

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Background

Study of correlations between the dynamics of different immune responses and the plasma viral load during acute HIV-1 infection (AHI) can provide important insight into the relationships between these responses and their potential impact on control of viral replication. To facilitate the analysis of multivariate datasets from AHI studies, there is an urgent need for development of novel statistical methods to allow reliable and efficient inferences to be drawn about correlations between multiple variables from sparse, irregularly-sampled longitudinal data.

Methods

Data from a study where plasma viral loads and cytokine/chemokine levels were measured in sequential samples collected during the eclipse and exponential viral expansion phases from US plasma donors acquiring HIV-1 infection were used as a test dataset. To capture the kinetics of changes in different markers given the short, irregularly spaced time series, a nonparametric mixed effects model was used to estimate both the subject-specific and marker-specific profiles over time (''curves''). Low-dimensional scores were also calculated to approximate the underlying curves. Among markers with elevated kinetics, un-directional dynamic correlations, representing how these innate markers synchronized relative to the viral kinetics, were also calculated. Cluster analysis was performed on the correlation matrices. A regression-based test procedure will also be developed to infer the directionality of the temporal associations between the analytes and HIV viral loads.

Results

Results from this analysis include clusters containing innate markers with similar patterns of kinetics relative to the course of viral expansion; and directed graphs showing how analytes rapidly upregulated in plasma in AHI including IFNα, IL-15, IP-10, IL-6, IL-8, IL-18 and IL-10 interact with each other.

Conclusion

The proposed analytic strategies have helped to overcome the challenges in analyzing complex, multivariate innate immune response data and will facilitate future studies of the host immune response in AHI.