Gag- and Nef-specific responses are associated with increased proportions of regulatory T cells in treated chronic HIV-1 infection

A Cocker*1, G Hardy1, A Herasimtschuk1, M Nelson2 and N Imami3
1Imperial College London, UK, 2Chelsea and Westminster Hospital, London, UK

Introduction

Interventions directly targeting the HIV-1 reservoir to achieve a cure (induction, immune recognition and clearance) are required, and CD4 T cells, mediators of HIV-1-specific response, are central to this. Functional and phenotypic immune profiles associated with slower progression rates have been demonstrated. Early and robust CD4 T-cell responses to Nef and a preserved Gag p24 proliferative response are associated with better disease prognosis. Furthermore, long-term non-progressors have less generalised CD4 T-cell immune activation compared to rapid progressors. This study aims to determine the relationship between virus-specific responses and regulatory T cell (Treg) frequency (Figure 1) in treated chronic HIV-1 infection.

METHODS

Peripheral blood mononuclear cells (PBMCs) from ART-treated HIV-1+ individuals were assessed in IFN-γ and IL-2 ELISpot assays (Figure 2 respectively), for their functional responses following stimulation with overlapping pools of Gag and Nef peptides (1,2). Subjects were characterised as responders to Gag (n=5), Nef (n=3), both Gag and Nef (n=2), or as non-responders (n=7) (Figure 3). Functional responses were then compared to the immunophenotypic profiles using flow cytometry and markers of Tregs (CD4, CD25, CD45RO; Figure 1) (3). Analysis of seronegative donors was also undertaken (n=10). Statistical analysis was performed using the Mann-Whitney U test (Figure 4).

RESULTS

All patients had CD4 T-cell counts >350 cells/μl blood and on ART for >12 months with plasma HIV-1 RNA <50 copies/ml. Percentage CD4 Treg subset was significantly higher in the HIV-1+ subjects compared to seronegative donors (p<0.0001) (Figure 4). Responders tended to have higher proportions of Tregs, and non-responders lower proportions, albeit higher than observed for seronegative controls (Figure 4). Treg frequencies did not differ between Gag and/or Nef responder groups.

Conclusions

Functionally classified responders have increased levels of Tregs during treated infection. This may indicate dysfunction of Treg-mediated suppression. Conversely, elevated Tregs may protect from excessive activation and exhaustion. As Tregs may represent a population enriched for the HIV-1 reservoir in virally suppressed individuals, it is key that the role of Tregs is understood to allow accurate therapeutic targeting in chronically infected individuals. Further in-depth studies, focusing on functional and phenotypic complexity of Tregs during HIV-1 infection and/or therapeutic interventions, are warranted (4, 5).

References

1. Herasimtschuk et al. (2014) Vaccine 32 7905-7913

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