SARS-CoV-2 vaccine-induced T-cell response after three doses in people living with HIV on antiretroviral therapy compared to seronegative controls (CTN 328 study)

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Introduction

Despite antiretroviral therapy (ART), people living with HIV (PLWH) suffer from a high burden of infectious and non-infectious pulmonary complications, suggesting that their lung immunity is not fully restored[1]. HIV infection may also favor a poor serological response to vaccines for viral agents, such as influenza and hepatitis B[2]. Ongoing concerns remain about the immune dysfunction caused by chronic HIV could and that it could hinder the induction and maintenance of immunological memory by SARS-CoV-2 vaccines[3]. Furthermore, few longitudinal studies compared COVID-19 cellular immune response between PLWH and seronegative controls, especially after the 3d dose.

Objectives

1. To assess cellular immune response generated by COVID-19 vaccines in PLWH after 1st, 2nd and 3d vaccine dose
2. To compare immunogenicity responses after the 3d dose in PLWH vs HIV-negative controls

Methods

Blood was collected from 39 PLWH on ART and 24 age-matched HIV-negative controls at baseline (**prior to vaccination**; **Visit 1**), **1** month post **1st dose** (**Visit 2**), 3 months post **2nd dose** (**Visit 3**), and 1 month post **3rd dose** (**Visit B1**). . Flow cytometry was used to assess ex vivo T-cell immunophenotypes and intracellular Tumor necrosis factor (TNF)-α/interferon(IFN)-γ/interleukin(IL)-2 following SARS-CoV-2-Spike-peptide stimulation. Comparisons were made using Wilcoxon signed-rank test for paired variables and Mann–Whitney for unpaired.

Results

Figure 1. Participant characteristics.

Study group (cohort)	HIV+ (CTN328) n=39	HIV- (SSO) n=24
Age, years (median, IQR)	44 (35, 57)	44 (34, 56)
Male sex, n (%)	n=33 (85%)	n=12 (50%)
Duration of HIV infection, years (median, IQR)(n=37)	7 (5, 21)	N/A
Undetectable viral load for at least 6 months, n (%)	n=31 (91%)	
If detectable, highest viral load over past 6 months (n=8) (copies/ml)/ Median (IQR)/ Range	182 (54.5, 2240) / (40, 1.00E+07)	
Antiretroviral regimen, n (%)		
NRTI	n=2 (5%)	
NNRTI	n=5 (13%)	
INSTI	n=29 (74%)	
Other	n=3 (8%)	
CD4 count, cells/mm3, median (IQR) (n=35)	700 (470, 900)	
CD4/CD8 ratio, median (IQR) (n=35)	0.82 (0.59, 1.12)	
CD4 nadir (cells/mm3), (n = 37)	290 (165, 455)	

Figure 2. SARS-CoV-2-specific T-cell cytokine response.

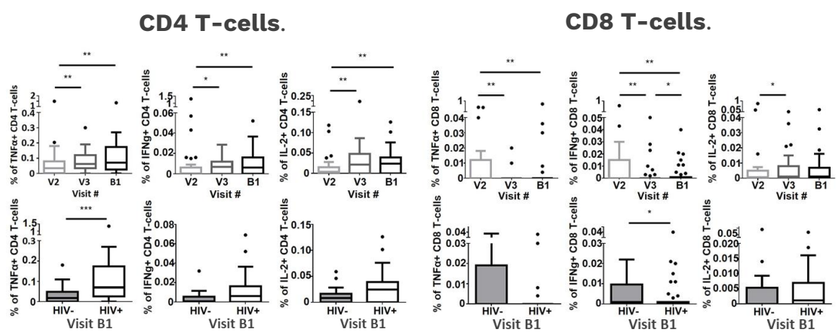


Figure 3. SARS-CoV-2-specific T-cell functional profiles.

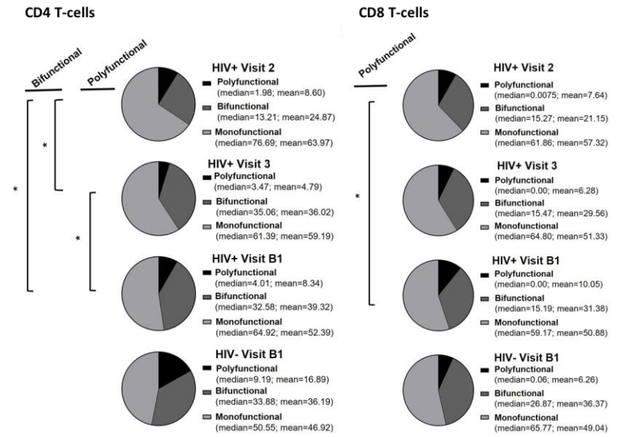
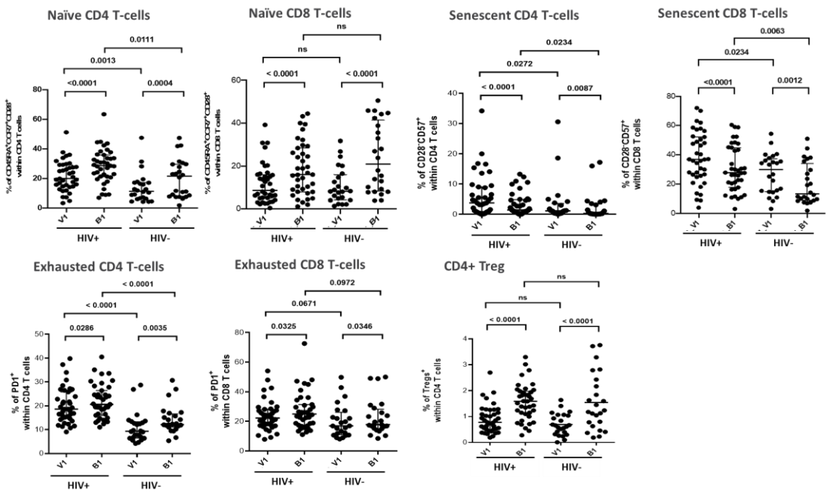


Figure 4. *Ex vivo* T-cell phenotypes at pre-vaccination baseline and 1 month post dose 3 in PLWH and seronegative controls.



Conclusions

Two doses of SARS-CoV-2 vaccine induced robust T-cell immune response in PLWH, which was maintained after the 3rd dose, with no significant differences in polyfunctional SARS-CoV-2-specific T-cell proportions between PLWH and uninfected controls post-3rd dose.

References

1. Alexandrova Y et al., Front Immunol, 2022
2. Tebas et al., AIDS 2010; Farooq et al., Curr HIV/AIDS Rep. 2019
3. Yang, Iwasaki, Curr HIV/AIDS Rep 2022

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