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Effectiveness of Messenger RNA-Based Vaccines Among People with HIV: a Case-Control Study

Luca Bortolani[1], Letizia Santinelli[1], Luca Maddaloni[1], Valentina Bleve[1], Emilio Altavilla[1], Giancarlo Ceccarelli[1], Claudio Maria Mastroianni[1], Gabriella d'Ettorre[1]
[1]Department of Public Health and Infectious Diseases, Sapienza University of Rome, Rome, Italy

BACKGROUND

- Chronic immune activation persists in PLWH despite effective ART
- Immune dysregulation may affect vaccine-induced responses

OBJECTIVE

To evaluate the **impact of chronic HIV infection** on humoral and cellular immune **responses to mRNA-based vaccination**

METHODS

- **Study population:** 20 virologically suppressed PLWH and 20 healthy controls
- **Timepoints:** before administration of first dose of BNT162b2 anti-SARS-CoV-2 mRNA-based vaccine (T0) and one month after second dose (T1)
- **Analyses:** measurement of anti-Spike antibody titers, phenotyping of T- and B-cell subpopulations and assessment of immune activation markers CD38 and HLA-DR in T-cell subpopulations
- **Statistical tests:** Student's t-test, Mann–Whitney U test, and Spearman's rank correlation

RESULTS

1. **Valid antibody response** after mRNA-based vaccination **in PLWH and controls**
   - Similar antibody response after mRNA vaccination in both groups
2. **Antibody response** at T1 in PLWH **correlates with basal immune status**
   - Positive correlation with CD4+ T-cell count and CD4/CD8 ratio
   - Inverse correlation with CD8+ T-cell count
3. **No** significant vaccine-induced **immune activation**
   - No post-vaccination significant changes in CD38 and HLA-DR expression in T-cell subpopulations
   - Higher baseline activation in PLWH compared with controls

mRNA vaccination **does not increase T-cell immune activation** in PLWH, despite effective antibody responses

Figure 1. Correlation in PLWH between frequencies of CD4+ and CD8+ T lymphocytes and their ratio at T0, and antibody titers T1 (* $p \leq 0.05$)

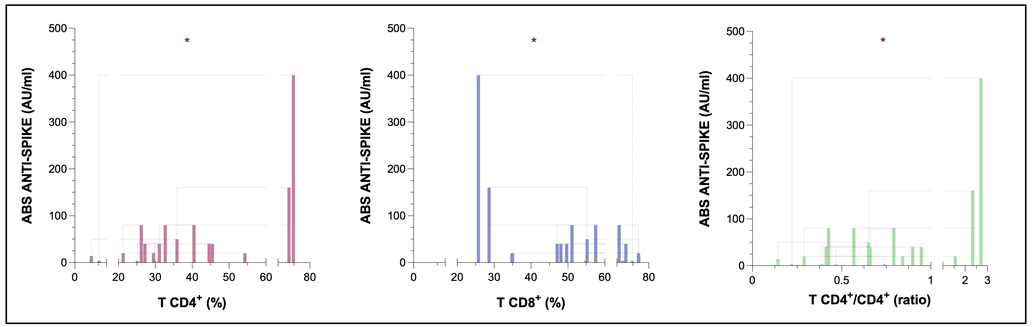
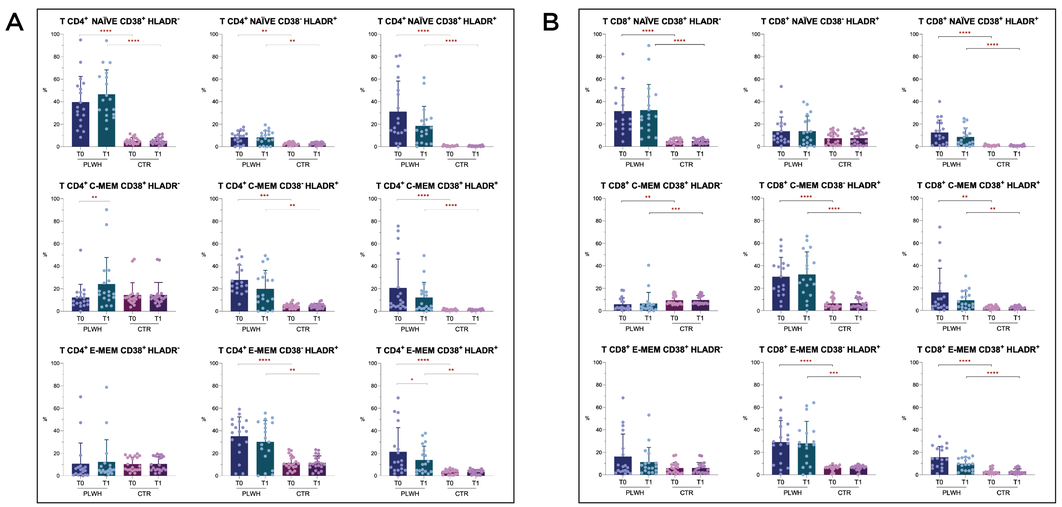


Figure 2. Expression of immune activation markers CD38 and HLA-DR in CD4+ (A) and CD8+ (B) T-cell subsets in PLWH and healthy controls, before (T0) and one month after (T1) second dose of BNT162b2 anti-SARS-CoV-2 mRNA-based vaccine (* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$; **** $p \leq 0.0001$)



CONCLUSIONS

- mRNA-based anti-SARS-CoV-2 vaccination has induced **effective antibody responses** in both people living with HIV and healthy controls
- In people living with HIV, humoral responses seem **associated with baseline immune status**, suggesting possible interindividual variability in vaccine response
- **No** clear vaccine-related **rise** in **immune activation** emerges, supporting a favorable safety profile
- These findings **need to be confirmed** by studies with **larger sample sizes** and a **greater number of time points**

AUTHOR CONTACT INFORMATION

Luca Bortolani, MD (he/him)
Resident in Infectious and Tropical Diseases
Department of Public Health and Infectious Diseases
Sapienza University of Rome
E-mail: luca.bortolani@uniroma1.it

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PLWH showed **effective antibody response** after mRNA-based anti-SARS-CoV-2 vaccination, **without harmful immune activation**.

Baseline immune status may influence vaccine response, highlighting the importance of **personalized care**.