Post-vaccination SARS-CoV-2 antibody kinetics and protection duration

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Dear Editor,

It will be difficult to mount an effective response to the SARS-CoV-2 pandemic without a clear understanding of the kinetics of the immune response to the virus [1,2,3]. A recent study looked at the kinetics of antibody avidity maturation in COVID-19 patients and showed that IgG avidity increased form 1-90 days associated with disease severity [4]. In a complementary way, another study in healthcare workers (HCWs) showed that a total antibody concentration greater than 141 BAU/ml provides 89.3% protection against SARS-CoV-2 infection [5]. In this study we determined the duration of protection conferred by the total antibodies taking into account the pre-vaccination infectious status and the waning humoral immunity.

We analyzed the total SARS-CoV-2 antibodies of 145 HCWs measured by ELISA (Wantai test, Wantai Biological Pharmacy Enterprise Co., Ltd, China) for 143 days (range 96-231) after their last injection of BNT162b2 vaccine. A total of 88 (60.7%) Elisa-negative HCWs and 57 (39.3%) infected HCWs were vaccinated and the subsequent decreases in antibody concentration were fitted to an exponential decay model. We observed a faster decrease for high initial total antibody concentrations at the peak. We segregated the vaccinated HCWs into three groups according to their total antibody concentrations one month after their second injection: <2000 BAU/ml, 2000 - 10,000 BAU/ml, and > 10,000 BAU/ml. This study was approved by the French Research Ethics Committee Est-III (COVID BioToul, ID-RCB 2020-A01292-37, ClinicalTrials.gov Identifier: NCT04385108).

The median age of the 145 HCWs (109 women, 75.2%) was 40 years (range: 23-60). The median protection time for vaccinated HCWs with initial antibody concentrations > 10,000 BAU/ml was longer in the infected workers (714 days, IQR: 700-832) than in the uninfected

workers (median 248 days, IQR: 238-284, p <0.01, Wilcoxon test). This relationship also held for HCWs with lower initial total antibody concentrations (2000 - 10,000 BAU/ml); the median protection time was 603 days (IQR: 468-634) in the infected/vaccinated HCWs and 309 days in the vaccinated/uninfected HCWs (IQR: 273-352, p <0.01, Wilcoxon test). Lastly, the median protection times for both groups of HCWs whose initial antibody concentrations were below 2000 BAU/ml were similar (infected/vaccinated: 570, IQR: 467-623; vaccinated/uninfected: 590, IQR: 558-633, p> 0.05, Wilcoxon test).

These data indicate that the post-vaccination total antibody titer decreases faster in vaccinated people with no previous SARS-CoV-2 infection (Figure 1A) than in vaccinated/infected individuals (Figure 1B). Most of the vaccinated/uninfected HCWs were protected for around 309 days while the infected/vaccinated HCWs were protected for about 714 days. Knowledge of such a difference could help optimize vaccination strategies.

NOTES

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Conflict of Interest

The authors declare no conflict of interest

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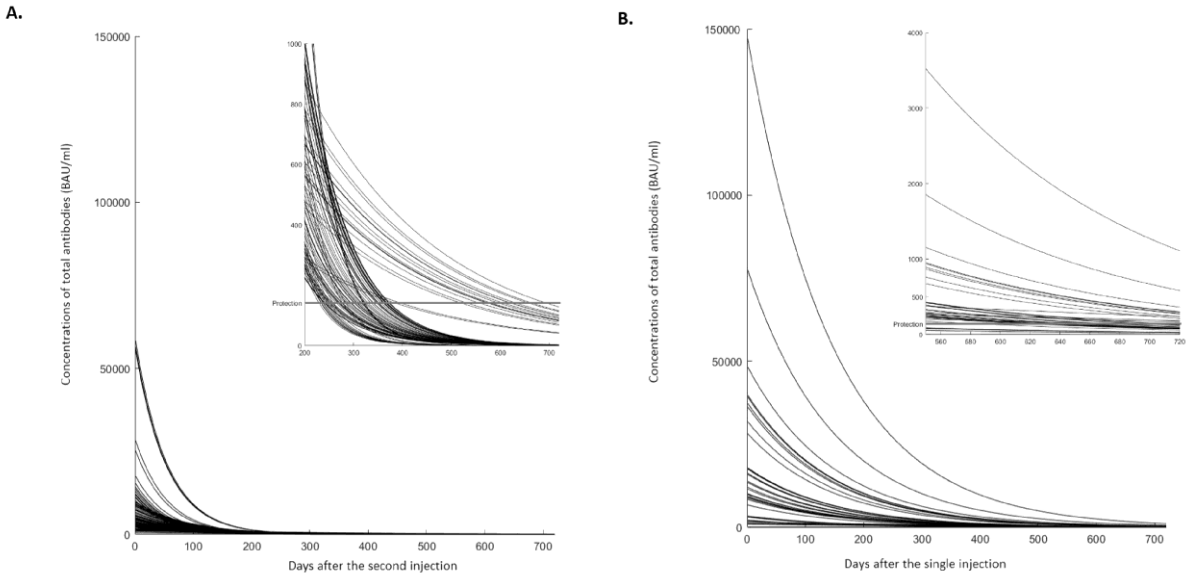
FIGURE LEGEND

Figure 1: Post-vaccination kinetics of total anti-SARS-CoV-2 antibodies among:

A. Uninfected/vaccinated healthcare workers
    a. >10,000 BAU/ml, the median half-life was 37 days (IQR:34-55),
    b. 2,000 - 10,000 BAU/ml, the median half-life was 61 days (IQR:52-79),
    c. <2,000 BAU/ml, the median half-life 188 days (IQR:121-349)

B. Infected/vaccinated healthcare workers
    a. >10,000 BAU/ml, the median half-life was 102 days (IQR:78-148),
    b. Between 2,000 and 10,000 BAU/ml, the median half-life was 105 days (IQR:97-119),
    c. <2,000 BAU/ml, the median half-life 252 days (IQR:142-363).

Figure 1


A.
B.
Concentrations of total antibodies (BAU/ml)
Days after the second injection
Days after the single injection
Protection
150000
100000
50000
0
100
200
300
400
500
600
700