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# Six-month longitudinal antibody kinetics of mRNA COVID-19 vaccines

To the Editor,

Since the sequence for the COVID-19 virus was made available in January 2020, vaccines have been developed and approved at an astonishing speed. The long-term vaccine efficacy of messenger RNA (mRNA) vaccines and antibody dynamics is yet to be clearly elucidated. Understanding the antibody kinetics and dynamics, particularly in infection-naive individuals, is necessary to assess the need for booster doses. In one of the first studies correlating antibody levels and titers, a significant trend of declining spike antibody levels was seen with time for BNT162b2 (Pfizer).[1] This trend remained consistent when results were stratified by sex, age, and clinical vulnerability. In another study, the data from Israel, of 1.3 million people vaccinated between January and April 2021 with BNT162b2 were analyzed for correlation between time-from-vaccine and afforded protection against SARS-CoV-2 infection.[2] The study found that the subjects vaccinated in January and February 2021 were 53% more likely to test positive for SARS-CoV-2 compared with people vaccinated in March and April. Subjects who were vaccinated in January 2021 had a 2.26-fold increased risk for breakthrough infection compared to individuals who were vaccinated in April 2021. In a recent study a 6-month follow-up on the BNT162b2 vaccine showed that on average, the vaccine efficacy declined by approximately 6% every 2 months.[3] Ibarrondo et al.,[4] reported that there was an average decline of antibody titers of approximately 90% in 3 months postinfection or vaccination. Naber et al.,[5] reported that BNT162b2 vaccinated individuals demonstrated a significant decline in antibody levels 6 weeks after the second dose.

Our study (Conforms to US Federal Policy for the Protection of Human Subjects) of 100 subjects who were vaccinated with either BNT162b2 or mRNA-1273 (Moderna), the serum samples were collected at Day 0 (pre-vaccination), Day 42 (14 days after second vaccine dose), and Day 180 (6 months after first vaccine dose). Subjects with prior exposure to COVID-19, positive polymerase chain reaction (PCR) test, or elevated nucleocapsid antibodies on a Total nucleocapsid antibody kit (Bio-Rad) on Day 0 were excluded from the study. The only subject who was not infected by SARS-CoV-2 (negative PCR; negative for total nucleocapsid antibodies on Day 0) and who completed the vaccine doses, had blood draws at Day 0, 42, and 180 were included in the study. Antibody against COVID-19 spike protein was measured using COVID-19 Antibody Chemiluminescence Immunoassay (Kangrun Biotech, Guangzhou, China and validated by KSL Diagnostics Inc., Buffalo, New York and approved under emergency use authorization). A cut-off index (COI) value of <0.8 is considered as negative for antibodies, 0.8–1.0 as indeterminate, and >1.0 is considered positive. Of the 100 subjects, 13 had received mRNA-1273 and 87 received the BNT162b2 vaccine. Of the 100 subjects, there was a 71% drop in average immunoglobulin G antibody values from Day 45 (fully vaccinated) (41.8 ± 18.2 COI) to Day 180 (12.2 ± 17.6). When broken down by age group, the older age group (>65 years) tends to decrease less (53% drop) from fully vaccinated (29.0 ± 20.7) to 6 months (13.8 ± 27.4) (Table 1). But this smaller drop in antibody value is probably due to the weaker initial antibody response with this older age group. The younger age groups follow the pattern of the entire group more closely, with the youngest group (18–40 years) showing the strongest antibody response. Seven subjects with positive antibodies at Day 45 became negative or indeterminate at Day 180, and six of seven were >65 years old. The drop in titer values over 180 days averaged at between 69% and 72% between the two vaccine manufacturers. There was no significant difference in the antibody values between the two vaccine manufacturers.

Our study adds to the emerging data pointing to waning vaccine-induced immunity levels and the possible need for booster vaccination based on the measurement of antibody levels. While routine monitoring of COVID-19 antibody levels and booster vaccine doses

**TABLE 1** Mean COVID IgG Antibody cut-off index value (COI) at different time points in different age population

| | Fully vaccinated (FV) | 6 Months after first vaccination | *p* Value | % Change (FV to 6 months) |
|---|---|---|---|---|
| Total ($N = 100$) | 41.8 ± 18.2 | 12.2 + 17.6 | <.0001 | −71% |
| 18–40 years ($N = 26$) | 53.4 ± 16.4 | 14.0 ± 10.8 | <.0001 | −74% |
| 41–65 years ($N = 51$) | 41.6 ± 13.6 | 10.6 ± 14.7 | <.0001 | −75% |
| 66+ years ($N = 23$) | 29.0 ± 20.7 | 13.8 ± 27.4 | .0477 | −53% |

are not yet advocated, our study adds to the emerging data pointing to waning vaccine-induced immunity levels and the possible need for booster vaccination based on measurement of antibody levels.

## CONFLICT OF INTERESTS

The author declares that there are no conflict of interests.

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