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16 **SARS-COV-2 INFECTION AND VACCINATION PATTERNS
DETERMINE LONG-TERM ANTIBODY RESPONSES IN
NURSING HOME RESIDENTS: DATA FROM NH-COVAIR**

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Background: Older Nursing Home Residents (NHRs) are at greatest risk of morbidity and mortality from SARS-CoV-2, particularly in the context of both waning vaccine efficacy and the emergence of Variants-of-Concern (VOCs). However, the determinants of long-term vaccine-induced protective antibody responses are yet to be determined in this group.

Methods: NH-COVAIR recruited older NHRs for comprehensive clinical and frailty (NH-FRAIL) assessment. Blood samples were obtained pre-vaccination, at 6-weeks and 6-months following primary vaccination and 6-months following booster vaccination. Antibody titres were measured using both an electrochemiluminescence assay and a custom bead-based array (Luminex™) to measure antibody titre and avidity for Wuhan strain/major VOC antigens. Stepwise adjusted linear regression (log-transformed) assessed longitudinal determinants of vaccine-induced antibody responses.

Results: Of 86 participants (81.1 ± 10.8 years; 65% female), just under half (45.4%) had evidence of previous SARS-CoV-2 infection. All NHRs mounted a significant antibody-response to vaccination at 5 weeks followed by a significant decrease in antibody titre by 6 months. Previous SARS-CoV-2 infection was the strongest predictor of antibody waning at all timepoints (β : 3.59; 2.89, 4.28; $P < 0.001$ for 6-months). Independent of infection history, both age (β : -0.05; -0.08, -0.02; $p < 0.001$) and frailty (β : -0.22; -0.33, -0.11; $p < 0.001$) were associated with faster antibody waning at 6-months. Cross-reactivity and avidity were significantly lower for Beta (B.1.351) and Gamma (P.1) VOC strains (all $p < 0.001$). Additionally, there was faster antibody waning and significantly reduced antibody avidity to Beta and Gamma VOCs in SARS-CoV-2 naive NHRs.

Conclusion: Older NHRs are capable of mounting protective antibody responses to SARS-CoV-2 vaccination. Responses were more durable, with a greater cross-reactivity to and avidity for VOCs in those with previous SARS-CoV-2 infection. Increasing age and greater frailty in NHRs was associated with faster antibody waning. Our findings support ongoing serological surveillance and use of additional vaccine doses in older NHRs, particularly in those without previous SARS-CoV-2 exposure.